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ABSTRACT

This volume, part of a series of monographs that explores the relationship between the economy and schooling, is intended to show how economists have sought to cast light on the economic nature of education, on resource allocation problems within the education sector, and on policy implications of such analyses. The first part describes the basic schools of thought in economics: the neo-classical school, the Keynesian school, the institutional school, the political economy school, and the Marxist school. The second part is an introduction to the basic economic concepts of production, exchange, and distribution. Remaining sections describe changes in economic and educational climates since the Second World War, human capital theory, the changing concern from macroeconomic to microeconomic issues in education, input-output relationships, recent developments in the economics of schooling, the influence of policy making on the economics of schooling, and future directions of the economics of schooling in Australia. An afterword provides reflections on evolutionary dynamics of ideas about the economics of schooling. Three readings by separate authors follow: (1) "Economics against Education," by J. Burkhead; (2) "Educational Production Theory and Teacher Inputs," by H. M. Levin; and (3) "Toward a Multilevel Perspective on the Allocation of Educational Resources," by D. H. Monk. An annotated bibliography follows. (TE)

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ESA845 THE ECONOMY OF SCHOOLING

THE EVOLVING ECONOMICS OF SCHOOLING

Ross Harrold

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ESA845 The Economy of Schooling

The Evolving Economics of Schooling

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Students enrolled in the course are also supplied with a guide to the course.

Series introduction

In recent times the effect of economic decisions upon the aims and development of schooling has become more marked. The economic dilemmas which confront most countries at the present time have created debate as to what the proper political strategies should be with regard to schooling and the way schools are administered.

The series of monographs of which this volume is a part explores the relationship between the economy and schooling, for the administration of education is necessarily tied both to optimising educational outcomes with regard to available resources and to providing insights and alternatives for future economic directions.

The arguments presented in these monographs examine some of the important dimensions of the economy of schooling. Beginning with a discussion of the current relationship between the economy and schooling, the series shows how economists have sought to explain the economic nature of education. An analysis of the effects of the economy on students and teachers is then presented in order to emphasise the human effects of the relationship between the economy and schooling. A further monograph explores the effects of the current technological revolution on the economy, the labour market and schooling. This is followed by a discussion of the importance of the production and control of knowledge and information, an aspect of the economy and schooling which is assuming great importance in our society.

It is hoped that the publication of this series will help to clarify some of the complex issues that are affecting the ways in which schools are currently administered. In the future we hope to add to the series further monographs which will add new dimensions to the debate on the relationship between the economy and schooling.

Peter Watkins

Peter Watkins
Course team chairperson

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The evolving economics of schooling

Introduction

The educational 'stage' is large and filled with a host of actors doing many different things for different purposes. Social scientists who seek to comprehend (even partially) what is going on must somehow limit their views in order to focus on particular activities from their own viewpoints. If you will, one group of social scientists shines a spotlight from its own disciplinary angle, highlighting specific features of some of the acting but leaving the rest of the stage in shadow. Other groups cast light on other acting and perhaps on the same acting as the first group, but from a different perspective. Or to use Allison's (1971, p. 2) metaphor, each group of social scientists looks at the acting with its own set of 'conceptual lenses' which bring certain aspects of the action into sharp focus and leave the rest hazy.

Whichever metaphor is more meaningful, there is clearly no single, comprehensive, all-solving social scientific perspective on education (or any other activity): each group of researchers reconstructs the play in its own way, studies particular types of interactions with its own kit of conceptual tools in order to investigate its own set of interesting questions. Not surprisingly, social scientists from different disciplines will give different reports about what they see is happening and why.

It would be wrong to believe that these reports inevitably compete with one another: as often as not they complement each other by revealing different aspects of an issue or problem. In considering student retention beyond the legal minimum school leaving age, for example, the sociologist would focus on such matters as attitudes of teenagers to schooling and family and peer group pressures, the economist would point up job market opportunities and the costs of staying on at school, while the psychologist would highlight ways in which the curricula, marking systems and authority structures of schools might have alienated particular types of pupils.

It is therefore not a matter of whether one perspective is 'more correct' than another, but of which is more relevant to your particular interests or more useful in helping you 'get a handle on' understanding a particular problem. It also follows that the more you know of the concepts and approaches of the various social science disciplines, the more you will be able to come to an illuminating understanding of any given problem.

The prime task of this monograph is to show how economists have sought to cast light on the economic nature of education, on resource allocation problems within the education sector, and on some of the policy implications of their writings. This is not to suggest that the light cast by economists is very pure, or even very bright. Economists, like other social scientists, come in different hues—from true blue to bright pink. And their lights are often not very miscible, as those will know who have followed the sporadic and sometimes acrimonious debate within the economics faculty of Sydney University over a proposal to establish a separate department of political economy. A preliminary task will therefore be to explain briefly the sources of difference among the different perspectives (called schools of thought) within economics.

Since the bulk of the published writing in the economics of education has been performed by 'conventional' neo-classical economists, a second preliminary task will be to introduce briefly a few of the main concepts of production, distribution and exchange which these economists use.

The evolving concerns of economics writing are heavily influenced by two factors: the major contemporary policy dilemmas and debates, and the state of the art. We therefore need to remind ourselves of the major economic, demographic, political and social questions of the post-war decades, and to note how economics as a field of study evolved during the same period.

With this background, we shall explore some of the contributions of economics writers to the understanding of the problems of allocating resources to and within education.

Two brief disclaimers are worth noting before we proceed. Firstly, research and writing on education is not a serious activity for a significant number of Australian economists. The major index of Australian periodicals, the Australian Public Affairs Information Service (APAIS), has no descriptor for 'economics of education', and the Australian Education Index does not include any of the six major economics journals in the periodicals it monitors. Secondly, what economics writing there is on education here and in other countries has been directed to a wide range of education-related problems. The writers and work discussed below are a very small sample, inevitably biased by my own approach to economics and by my concern to show how the thought and writing of economists have been influenced by changing policy issues.

Schools of thought in economics

Anyone who wishes to evaluate critically the policy analyses and recommendations made by different economists should appreciate what are the major schools of thought within the discipline. To do this the person should understand how members of these schools differ in their philosophical premisses, their approaches to analysis, and the nature of their likely policy recommendations. I shall briefly introduce five schools: the neo-classical, Keynesian, institutional, political economy and Marxian. My purpose is to do no more than note in a very simplified way a few elements of their members' ideological positions (i.e. their conceptions of the 'good society'), how they see the relationships between economic and social factors (particularly as they affect education), their methods of analysis and the natures of the educational policy recommendations which are likely to flow from their analyses.

The neo-classical school

This is generally considered to be the orthodox or conventional school of economics. A distinguishing ideological characteristic of members is the high value they place on individualism – the view that the individual ought to be allowed the freedom to pursue his or her own *karma* with minimum restrictions imposed by government. They believe that co-ordination of the myriad activities of individuals in pursuit of their own self-interest is achieved by the incentive effect of market prices. Prices act like an invisible hand to encourage producers to respond to consumer demand by increasing production of those commodities whose prices are rising (because of strong consumer demand) and by discouraging the production of those commodities whose demand and prices are falling.

While neo-classical economists do acknowledge some shortcomings (failures) of the market and hence the need for government intervention, they would want intervention to be minimised. They would press for the principle of subsidiarity – that decisions ought to be left to those who are directly affected by them. Economists such as Milton Friedman believe that the national government should limit its role to defending the country, ensuring overall economic stability by controlling the money supply, and serving as an umpire to prevent people coercing one another. The real forces which determine the wealth of a nation – the capacities of its citizens, their industry and ingenuity in pursuit of their own self-interest – will ensure innovation, growth and a steady, long-run increase in standards of living.

Neo-classical economists tend to place a high value on the scientific rigour of their analytical approach. Many of their theoretical models are designed to discover conditions of optimality, under which a producer will earn greatest profits or a consumer will receive highest satisfaction from a given income. The models usually comprise relatively few, quantifiable variables and are premissed on the rational, goal-seeking behaviour of individuals and consistent *production functions*, i.e. the physical relations between changing inputs and the resultant changes in output. Consideration of unquantifiable and non-economic variables is usually avoided by lumping them under the rubric *ceteris paribus* ('other things being equal').

The above description helps to explain why there has so far been little research interest by neo-classical economists in the process of education: most important educational resources and products are unmarketed; there are few, if any, consistent production functions; and educational goals are often nebulous and under dispute. To economists interested in rigorous analysis, therefore, educational activity provides unpromising research material. Nevertheless, some economists have been willing to explore the application of neo-classical concepts to educational processes. Later we will note some of their efforts.

Out of their ideological concern for individualism and the efficacy of markets, neo-classical economists have at times written almost passionately to influence policy in the finance of education. Led by Milton Friedman, they have drawn a distinction between the public support for, and the public provision of, education. They have advocated redirecting resource flows to schools away from bureaucratic governmental channels towards parents. Under this scheme, the parent of every school-aged child would receive a voucher for the estimated cost of teaching the child for a year. This would be presented to the enrolling school which would in turn 'cash' them at the government treasury. Essentially, parents would be given the means to 'buy' educational services. The resources available to a school would depend on its ability to attract pupil enrolments. Competition among schools for enrolments would encourage them to be more responsive to pupil and parent wishes.

The Keynesian school

While the Keynesian school has little to say on educational policy matters, it is worth noting because it marks a progression away from the *laissez-faire* position of the neo-classical school, towards schools which advocate a more active role for government.

John Maynard Keynes has been the most celebrated – and controversial – British economist of this century. Writing during the inter-war period, particularly during the Great Depression, he destroyed the neo-classical notion that the natural, or equilibrium, state of a market economy was that at which nearly all willing workers found employment. He showed that a market economy could find its equilibrium just as well with a very large amount of unemployment, if aggregate (or total) demand was insufficient.

Keynes proceeded to the obvious prescription, that the national government should intervene by borrowing and spending enough to offset the shortfall in aggregate demand. Conversely, in times of excess aggregate demand the government should increase its revenues, reduce its expenditures and repay its earlier borrowings. This is called 'countercyclical' economic policy.

Keynes's theory sought to combat the high unemployment levels of the 1930s: it is inadequate to explain the causes of, and to develop policies to combat, the current dual problems of inflation and unemployment. Nevertheless, the significance of his ideas for us is that they helped to justify the very major increase in government intervention in Western economies over the last half-century.

Note, however, that Keynes can still be accommodated within the ideology of the neo-classical school: he did not attack the notion of the motivating power of self-interest, and he did not attack the benign regulatory and co-ordinating role of competition and the market. His concern was to restore a depressed economy to full employment, at which the market system would again operate 'normally'.

The institutional school

Members of the institutional school are not noted for holding any particular strong ideological commitments. Their main concern is to inject more realism into policy analysis by economists. They criticise neo-classical economists who base their theoretical reasoning on assumed universal traits of rational decision makers who pursue their own self-interest, and who limit their models to 'economic' variables. They would prefer to study economic behaviour empirically, without first stating any premisses about universal behavioural traits.

Institutionalists such as J. K. Galbraith and Lester Thurow of the United States of America and Gunnar Myrdal of Sweden take a 'holistic' viewpoint, i.e. they highlight the interconnectedness between economic behaviour and the social and cultural institutions and activities within which it occurs. They claim that despite their theoretical sophistication, neo-classical models are too simplistic, often resorting to the phrase *ceteris paribus* to artificially hold steady the behaviour of fundamentally important non-economic variables. In fact Myrdal replaced the distinction between 'non-economic' and 'economic' factors with 'less relevant' and 'more relevant' factors.

The holistic approach leads institutional economists to seek to work with and learn from other social scientists – particularly political scientists and sociologists. They use no particular set of concepts or analytical techniques; they are willing to allow the nature of the subject-matter to dictate the specific method most appropriate to their analytical task. Unlike neo-classicists who are primarily concerned with prediction, institutionalists see their task as explanation – to explain how particular events or actions fit into a pattern that characterises the ongoing processes of change in the whole system (Wilber & Harrison 1978, p. 73).

The policy recommendations deriving from institutional economists are influenced by their perception that the activities of a diminishing proportion of producers, workers and consumers are affected by the operation of the market mechanism. Powerful groups and organisations such as trade unions, corporations and public enterprises are able to circumvent the structures of the market to protect their own self-interest. These groups require the government to legitimise their actions, to reconcile conflicts which arise within and among themselves, and to minimise the impacts of their actions on the rest of the economy.

Any government which is to play this affirming, mediating and mitigating role effectively must, according to institutionalists, actively plan the course of economic activity. One aim of this planning must be to protect those who are likely to be disadvantaged by the conflicts among the powerful sectors. And part of public educational planning would be to stress compensatory education, to improve the school achievements and they hope, the life-chances, of 'at risk' students.

The political economy school

Whereas the institutionalists' differences with the neo-classical school are primarily analytical, i.e. whether knowledge is best gained from rational or empirical means, the political economists' differences are both analytical and ideological. Members of the political economy school generally perceive economic problems within the context of subject–ruler relations – that is, relations of domination and servitude, of power, conflict and disruptive change (Hunt & Sherman 1981, p. xix.) The radical critics who are members of this school question the basic legitimacy of the current power structures of Western economies. They believe that the corporate owners of capital, particularly the multinational corporations, use their surfeit of commercial and political power to manipulate the economic and social conditions of a community to their own advantage. Some would claim the manipulation also of international tensions in order to enhance the prosperity of the military–industrial complex.

The educational policies proposed by members of the political economy school tend mainly to be concerned with trying to break the power of capitalistic employers over the curriculum of schools and colleges, with attacking inequalities (of sex and race) and inequities within education, and with achieving greater participation by students and staff in a more democratic educational system.

The Marxist school

Members of the Marxist school agree in principle with the ideological viewpoint and the social analysis of Karl Marx (1818–1883). They see economic ideas as only a part, albeit a fundamental part, of wider sociological and political theories about social evolution. Against the individualism of the neoclassicists, their perspective is socialistic in the sense that the source of an individual's identity is the society and it is social relationships which determine a person's consciousness of the world. Thus the concern of the socialist is with the condition and welfare of the whole society, not of the individual.

The Marxist analysis focuses on the historical evolution of the class structure of societies, which is seen to result from the changing organisation or mode of production. The class structure of capitalist states, for example, reflects the sharp divisions between the owners of capital and the non-owners (workers). Differences in the wealth, power and interests of these classes generate internal contradictions which render the capitalist state inherently unstable. For example, because profit-seeking capitalists exploit the workers and seek to replace them with machines, the workers lack the spending power to expand markets at the same rate as the growth in factory production. In consequence there are inherent tendencies towards overproduction and declining returns on capital – which shake the stability of the capitalist system.

Marxists reject the role of the market in resolving conflicts between employers and employees or between producers and consumers. They see the market system as a product of class domination and class struggle, with the rules of the market being devised to suit the particular interests of capitalists. Moreover, the inequalities of family wealth generated by the market system enables *social reproduction* to occur over successive generations. Rich capitalist parents are able to raise their own children 'with silver spoons' – to buy them a superior education and to ensure that in the 'meritocratic society' they enter managerial careers which tend to replicate their parents' place in society. Worker parents, on the other hand, find it very difficult to provide the environment and resources for their children to continue with their schooling, to succeed at competitive examinations and thus to qualify for jobs which lead to careers at the managerial level.

More than this, Marxists see educational curricula, teaching methods and examination structures as part of a vast, subtle *superstructure* which not only helps to legitimise and perpetuate the existing class patterns but also serves to inculcate in the young the traits and values necessary for reproducing a compliant, productive working class.

Clearly, Marxists see the root causes of problems of education systems lying far deeper than within the systems themselves. Their policy prescriptions therefore refer beyond these systems to the nature of the class structure itself. Policy proposals which do relate to the education sector are mainly directed towards breaking down the competitive, hierarchical nature of curricular content and methods, and towards the 'democratisation' of educational institutions – to allow more 'worker' (staff and student) control of what takes place within schools.

Reflections on schools of thought

This brief survey has raised a few of the basic issues which divide economists into different schools. One issue relates to where we should begin looking for fresh knowledge. Is it best to begin by drawing inferences from what we see, or first logically to derive propositions for testing from theoretical premisses? If the former, how do we know where to look unless we have *some* theoretical hunches at the back of our mind?

How many and what types of variables should be included in our analysis? Will we, for simplicity and clarity, select a few, well-defined, quantifiable economic factors whose relationships can be mathematically specified, or will we include more qualitative social and political factors which, while they may render the analysis more realistic, will also make it less manageable?

What is the purpose of the analysis? Is it to try to predict the consequences of changes in policy variables, or is it primarily to understand and explain – with or without the intention of developing appropriate policy changes?

And, most fundamentally, what is a problem worthy of study? Do we accept that 'the system' is fundamentally sound and the problem is to make it work a little better (more efficiently)? Or does the problem lie with the nature of 'the system' itself? If so, why try to patch and darn when the whole fabric needs to be rewoven?

The answers any person gives to these questions depend partly on the ideological bent of the individual and partly on the nature of the problem to be solved. (What help can the Marxist approach give to deciding the resources to be allocated to Year 9 French?)

Because most of the recently published writing about education has been produced by 'conventional' economists of the neo-classical school, much of what follows reports some of the concepts and notions traditionally used by members of that school. If you disagree with the neo-classical approach, you will read the reports more critically than otherwise. That is all right, but be clear about the basis of your criticism: you may gain useful insights even if you disagree with the approach. In any case, you will be better prepared to counter the policy arguments of an economist of the neo-classical mould if you have learnt something of the hard core of fact and analysis from which he or she is arguing.

Introduction to some economic concepts

This section gives a brief introduction to some of the terms and concepts which are the stock-in-trade of the conventional (i.e. neo-classical) economist. A more detailed treatment of economic concepts relevant to the study of education is given in Harrold (1982).

The focus of the 'conceptual lens' of conventional economics is on the production, exchange and distribution activities of communities. The economist's interest is not simply to study the activities for their own sake, but to understand how they come to transform the limited resources that are available into *commodities* (goods and services) which satisfy people's wants; that is, yield *utility*.

Two important points flow from the fact that resources are limited in relation to people's wants for commodities. The first is that, since the welfare of a society is increased if more of everyone's wants are satisfied, the economist is interested in finding ways to increase the worth of commodities produced from available resources. In principle this is achieved by allocating resources to where their return, i.e. benefits generated, is greatest.

The second point is that if a particular resource is used to produce Commodity A it cannot usually be used simultaneously to produce Commodity B. The *real cost*, or *opportunity cost* of putting that resource to its first use (in Commodity A) is the benefits which *are forgone* by *not* being able to use it to produce Commodity B. This may sound a ponderous way to define cost, but it really is quite a powerful notion.

Let us take a simple example. Your personal time at this moment is a resource, in that it can be used to do a number of things, i.e. produce a range of services which yield satisfaction. One other thing you could be doing is watching television. But you cannot be reading this essay and watching television (simultaneously). The real or opportunity cost to you of your time resource used in reading are the benefits you are *forgoing* by *not* watching television. This simple notion underlies much economic evaluation of competing uses for scarce resources.

Let us now look at a few relevant ideas which emerge from the neo-classical economist's interest in production, exchange and distribution activities.

Production

A key interest of economists is in the *efficiency* of production activities, i.e. the relation between the value of resource inputs and the value of outputs. This interest derives from a deeper interest in welfare: if efficiency improves, more (valuable) wants can be satisfied with the given resources. Note that the economist's notion of efficiency is one based on value, not quantity, relationships between inputs and outputs. Efficiency will be improved if less expensive inputs can be substituted for more expensive inputs, without affecting outputs and/or if with given inputs, more valuable outputs can replace less valuable outputs. (Note however that in non-market situations values to inputs and outputs are ascribed by some authority. It is fair to ask who this authority is, and on what grounds it ascribes these particular values.)

A common method of evaluating the potential efficiency of alternative resource-using projects is with *benefit–cost analysis*. The higher the value of benefits derived in relation to the costs incurred over the life of a given project, the higher the benefit–cost ratio (or the lower the cost–benefit ratio) and the more attractive the project. An alternative formulation to benefit–cost ratio is the *rate of return* which expresses the expected annual return (of benefits over costs) to investment in the project.

Another interest of the economist is the *growth* of production over time. If the value of production increases faster than population growth, average standards of living and hence welfare will improve (if distribution does not change adversely).

The economist uses the following simple explanatory model of factors affecting the rate of a country's growth. Current production has two uses: it is *consumed* (i.e. provides immediate satisfactions) or it is *saved* (i.e. put aside). That which is saved can be made available for *investment* (i.e. maintaining or adding to the stock of *capital*). The higher the rates of saving and investment and hence the expansion of capital stock, the greater is the growth of a country's productive capacity and hence its potential standard of living.

Exchange

The second major area of interest to the economist is exchange – the voluntary 'swapping' of goods and services among people and organisations. This is sometimes direct barter, but more usually is indirect, using money. The two-way transfer is voluntary because each party expects to gain from the exchange. 'You do this for me and I'll do that for you.'

While most economists would have us believe that all exchange is two-way, there are also interesting one-way transfers called *grants* (Boulding 1970, ch.1). One voluntary form is a parent's grant of money or services to a child. The grant derives from the integrative relationships between giver and receiver. 'You do something because of what you are and what I am.' There is also an involuntary one-way transfer – that which derives from veiled or explicit threat: 'You do something I want or I will do something that you do not want.'

Two-way exchanges take place in a *market*. The *price* of a freely marketed commodity is the result of the strength of the *demand* by buyers relative to the amount of *supply* by sellers. These prices serve three important functions in economic activity. They transmit information about the state of the market to both potential buyers and sellers. They provide incentives to producers to behave in ways consistent with the wants of consumers. Thirdly, the prices received and paid affect the distribution of incomes among members of society. (See Friedman & Friedman 1980, ch.1.)

Neo-classical economists have brought together production and exchange considerations in general equilibrium analysis. With this they have shown that if there were perfect competition among many small firms selling private goods to large, freely operating markets, then both production and exchange would be efficient and (under certain conditions) equitable. That is, it would not be possible to change the allocation of resources or products without making at least one person worse off. Societal welfare would be at the highest level possible.

Unfortunately, we do not live in an ideal world. Competition is imperfect because of inadequate dissemination of information, leads and lags in response to market changes, and because some markets are dominated by single (monopolistic) suppliers or a few large producers who use their power to interfere with the behaviour of markets.

More importantly, there are two important types of commodities which cannot be marketed and consumed like 'normal' goods. The first are those which occur naturally and whose benefits are freely available to all, and the second are those which, if they provide benefits to anyone, provide them to a large group of people, whether or not they pay for their production.

While we highly value pleasant surroundings, clean water and an unpolluted environment, these have no price because they cannot be marketed – they are 'free gifts' of nature. Producers are sometimes tempted to minimise their own private costs by disposing of their wastes into these 'free gifts' – by discharging liquid effluent into streams, or dust and gaseous effluent into the atmosphere. These actions generate *externalities* or *spillover effects* by influencing the benefits which other people receive from their environment.

The second type of commodities for which normal markets do not apply are those that are consumed collectively, not individually. Normally consumption of a (private) good by one person precludes consumption by another. (If you eat an apple, I can't eat it too.) There are some commodities, however, whose consumption by one person does not limit the consumption by another. My listening to a radio or television program does not affect your listening to the same program. The protection I receive from our national defence forces does not limit the protection you receive. There cannot be a market, in the normal sense, for these *public goods*. For a market to work, individuals who want to receive the benefits of a commodity must buy it, i.e. bid it away from other persons or uses. But no such bidding is needed for public goods, because one person's consumption does not reduce another's: the benefits from their production are freely available to all who can consume them. It is difficult to recover the costs of producing such public goods, because of the 'free rides' consumers want to take, by consuming them without helping to pay for their production.

The existence of these phenomena – unmarketable commodities, imperfections caused by monopolies and large operators, externalities and public goods – lead to some *market failure*. That is, they prevent the market system from generating the level and distribution of outputs which are the most desirable from the point of view of social welfare. Herein lies a case for *government intervention* into the market economy by means of rule-making, taxation and public expenditures.

Distribution

In a market society the owners of the factors of production – land, labour, capital and enterprise – receive different types of income. Owners of *land* receive *rent*, those of *labour* receive *wages* and *salaries*, of *capital* receive *interest* and of *enterprise* receive *profits*. The levels of incomes received depend on the relative strengths of supply and demand in the final product markets, the importance of factors in production and the amount of factors which individuals own.

In countries like Australia the main productive resource of people is their acquired personal productive capacity – what economists call *human capital*. Human capital is due largely to educational activities building on people's innate intelligence to enhance the skills, knowledge and attitudes necessary for satisfying their own wants directly and the wants of others indirectly (by the goods and services they help to produce).

The amount of the various resources each of us owns is partly the result of chance (our genes, our family environment, our property inheritance) and partly a result of choice by ourselves and others (how we use our resources, how hard we study and work, the guidance of our parents).

In every society, no matter how it is organised, there are complaints about how income is distributed among members of that society. This is basically a *normative* issue – a matter of personal values: there is no objectively 'correct' distribution of income. The resolution of this normative issue lies in the realm of politics and government, not of economics. In practical terms this means that an alteration in the distribution of incomes over that which would ensue in a market society is another purpose of government intervention. The economist can nevertheless analyse the causes and consequences of a particular distribution of income. Moreover, the neo-classical economist points to the intimate connections between this function of the price system – distributing income – and the other functions – transmitting information and providing incentives. This economist would warn that the best-intended political policies to 'improve' income distribution (e.g. by setting minimum wages for young workers) can have counter-productive effects on other functions of the price system (e.g. if the policies exacerbate teenage unemployment).

Changes in economic and educational climates since the Second World War

There is a close secular interaction between the states of a country's economy and its education system. Both are affected by birth rates and migration patterns. The rate and direction of economic growth conditions the nature and state of job markets which school leavers enter. The wealth produced by economic growth affects the resources which can be made available for the educational sector. On the other hand, the knowledge, skills and attitudes passed on to students have a long-term effect on the employability of job-seekers and the innovative and productive potentials of the workforce. It is thus reasonable to consider concurrently the fates of the economies and education systems of Western countries over the last three or four decades.

After an initial readjustment period following the end of the Second World War hostilities, there was a world-wide resurgence of economic and population growth. With years of shortages and rationing behind them, people's demand for housing, home comforts and other consumption goods ensured expansive markets for producers. Investment to build new factories and to refurbish old ones ran at high levels. The buoyant economic conditions affected and were affected by the post-war 'baby boom'. In Australia, the annual rate of natural increase (birth rate minus death rate) nearly doubled from 0.8 per cent in the 1930s to 1.4 per cent in the 1950s. To this was added a high annual rate of net immigration – from 0.05 per cent in the 1930s to 0.89 per cent in the 1950s. Immigration was particularly significant because it brought from Europe able-bodied, skilled workers (i.e. with 'human capital'), many of whom were sent to remote pioneering settlements to undertake work which few existing Australians wanted to do.

The groundswell of development forces was so strong that it carried Australia on a wave of virtually full employment with stable prices throughout the 1950s, 1960s and into the early 1970s. Our education system grew rapidly in both quantitative and qualitative terms. The increasing numbers and widening geographic spread of youthful Australians placed severe demands on building and staffing schools. To this was added pressures for 'beefing up' the curricula in the post-Sputnik era, and providing comprehensive secondary education as pupils began to stay longer in schools.

The urgent clamour to expand productive capacities in both the private and the government sectors created very strong competition for investment funds. Within the government sector itself, pressure groups were continually arguing for more road building, harbour and railway construction, the upgrading of communication facilities, and many other forms of investment in our economic infrastructure. All these pressure groups could present lots of impressive quantitative data showing the tangible financial benefits to be gained from their particular schemes.

Educators were desperate to find ways to demonstrate that spending on education was more worthwhile than spending on other forms of development. To do that, they had to persuade politicians that public money allocated to education would yield pay-offs which were as great, or greater, than that spent on infrastructural works.

In the early 1960s economists provided just the argument needed. By using evidence on people's age, education and income, some economists demonstrated that expenditure on education yields a quite substantial pay-off. Indeed, if expenditure on education was considered as an investment in human capital, its rate of return could be shown to exceed that on physical investment in roads or railways. Later we shall study some of the technical aspects of this reasoning. Our point here is to note that this economic argument helped to reaffirm the importance of the 'human factor' in economic development.

In the 1970s the wave of development broke. The shoals of OPEC provided a major trip mechanism, but spiralling oil prices were only the most spectacular event in a toppling international payments system which had been unbalanced *inter alia* by the USA folly in Vietnam. Within domestic economies too, complex stresses were becoming obvious. After nearly three decades of labour shortages, trade unions had gained considerable industrial power. By using militant tactics, they sought to protect themselves against rising import prices by forcing wage gains. Employers increased prices to maintain profit margins. Consumers reacted to rising prices by buying fewer goods. With weaker demand and increasing costs, producers cut back on production and employment. The result was stagflation – an unwelcome combination of rising rates of inflation and unemployment. Retail prices, which rose at an annual rate of 3 per cent in the late 1960s, soared to 15 per cent in the mid-1970s. Unemployment rates which were below 1.5 per cent to 1970 rose beyond 4.5 per cent by mid-decade.

Concurrently with this economic crisis there was occurring a less dramatic, but significant change of public attitude to the role of government. Although the private sector expanded strongly after the Second World War, the government sector grew even more strongly. Public outlays as a percentage of all outlays rose from 25 per cent in the late 1940s to 36 per cent in the mid 1970s (Groenewegen 1977, p. 6). Government regulations increasingly constrained individual and corporate behaviour. And progressive income tax structures meant that public revenues increased at a faster rate than personal incomes.

The peak of public sector affluence in Australia was during the Whitlam Labor Government, 1972–75. Public outlays during this period rose in real terms (i.e. net of price changes) by 17.7 per cent, compared with an increase of 10.9 per cent in real national expenditures. By 1975–76, the average adult Australian was paying $2445 per year in taxes (Samuel 1977) when the average annual earnings was $8820. Thus, on average, more than one dollar in every four dollars earned went in tax. Some commentators have claimed that the demise of the Federal Labor Government in December 1975 was in part a response to the Liberal–Country Party's promise of reducing the federal tax burden (see, for example, T.Hewatt & D.Wilson, 'The great tax burden', *Weekend Australian,* 15–16 and 22–23 July 1978.)

The flip-side of lower taxes is, however, lower outlays on government functions. From 1976 the Liberal–NCP federal government set about restraining the growth of its public service and hardening expenditure ceilings. Education, whose potential for vote-catching diminished markedly in the mid-1970s, was one function where screws were applied very firmly. Since the commonwealth funded tertiary education fully but schools only partially, it was able to clamp down on tertiary (capital) spending somewhat more quickly and easily. Overall, commonwealth expenditure on education absorbed 9.3 per cent of budget outlays in 1974–75, but dropped to 8.7 per cent in 1975–76, then down to 8.0 per cent in 1980–81.

It is interesting to note reasons for the turn-around in the political popularity of educational spending in the mid-1970s. One financial reason was that the heavy spending by federal and state governments had significantly reduced most of the glaring resource deficiencies in schools by the time Labor had been voted out. Resource-use targets for schools, which the Schools Commission had set for 1981–82 had been largely met in state schools by 1976–77 (Schools Commission 1978, p. 16). A demographic reason was that for the first time since the war, enrolment growth in government schools slowed to a crawl, with (the more expensive) secondary enrolments actually falling from 1976–77. This had marked repercussions on teacher-training institutions. These institutions had struggled for three decades to overcome a chronic teacher shortage. With commonwealth help in the early 1970s, there was a great increase in the numbers of teachers in training. The increased numbers of trained teachers began graduating, just as the pupil population growth halted. In the name of 'improving educational standards' and meeting their employment obligations to bonded trainees, some states attempted to reduce the teacher oversupply by hiring well beyond their physical capacities to create new classes. All states slashed trainee intakes.

One of the most important reasons for the diminished public support for education in the 1970s related to the direct and indirect effects of a recessed labour market. Traditionally Australians had looked to a good education as a sure means to land a secure, full-time job. When the labour market turned bad in 1974, it turned putrid for teenagers. The unemployment rate for 15–19 year olds jumped from 5.5 per cent in 1973–74 to 14.5 per cent in 1976–77 (Australian Bureau of Statistics 1978, p. 88). Some employers and journalists blamed high youth unemployment on the school system which (they claimed) did not ensure that leavers were functionally literate or employable.

Whatever the reasons for education 'running off the political rails', the reality was that after three decades of sustained growth of pupil numbers and resources, the mid-1970s saw a stabilising and even a recession in the level of educational finance and activities. And this was not a peculiarly Australian phenomenon. In the United States of America, for example, a 1970s 'tax revolt' culminated in California's 'Proposition 13'–a ballot initiative that forced a halving of local property taxes, which were the major source of school funding in the state.

The impact on educational administrators of the financial turnaround was profound. For more than a generation, the continuously increasing flow of resources to education made it reasonably easy to provide for educational developments, largely out of additional funds and without seriously disturbing ongoing activities. Under these new circumstances, the demands for new developments were as strong but, if their implementation required resources, these had to be obtained by cutting back or curtailing existing activities. The problem changed from allocation of net additions to resource flows to reallocation of constant or diminishing flows. The 'opportunity costs' of new developments became more evident. Given the interests vested in existing resource patterns, it was not surprising that the administration of educational finance grew to be more complex, difficult and contentious.

Human capital

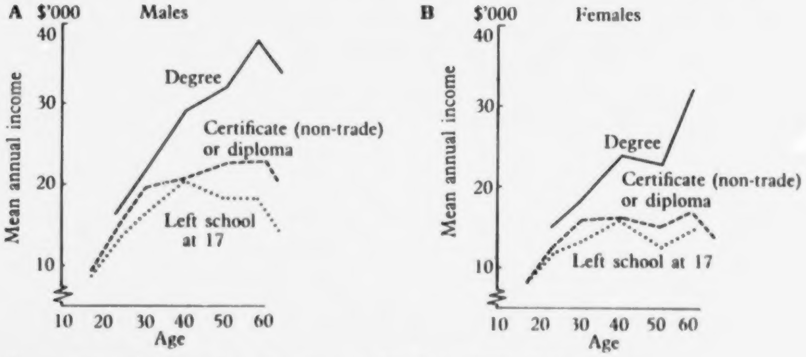
Economists became interested in the notion of human capital out of their concern with economic growth and efficiency of resource allocation – not with education *per se*. In the years immediately after the Second World War economists focused a good deal of their attention on the physical factors affecting the rate of a country's economic growth. As mentioned earlier, they found that models which sought to explain growth in terms of increases in land, labour and investment in physical capital were inadequate. A missing 'residual' factor was the skill, knowledge and health of the people who designed, produced and applied new technology, which increased the productivity of other factors.

This led to a revival of interest in the idea of human capital. Just as a business can increase its productive capacity by investing in its stock of physical assets, so too (argued the economists) can people increase their own productive capacity by 'investing' in their own stock of knowledge, skills and attitudes. Hence the economist's (indirect) interest in education.[1] In this sense, 'investing' refers both to the outlays involved in purchasing the teaching services, space, equipment and supplies involved in formal tuition, and to the 'opportunity costs' of the earnings which the student forgoes by being in education rather than in paid work.

The main feature of capital is its durability, that is, its ability to keep enhancing the production of 'things' over a series of years. The 'things' in which economists are most interested are those which can be sold and valued at market prices.[2] In terms of human capital, economists conceive that the things enhanced are the individual's labour services, for which employers are willing to pay higher salaries or wages. The increased earnings of the more educated worker, above those of the less educated worker, are taken as a measure of the enhanced value of services generated by the additional human capital from more education.

To illustrate, Figure 1A and B relate the mean 1981–1982 age-specific earnings of full-time male and female workers with different educational attainments.

Figure 1: Mean age-specific earnings of full-time workers with specified levels of educational attainment, Australia, 1981-82



Source: Compiled from Australian Bureau of Statistics (1984, Table 7, p. 11).

Note that these graphs plot cross-sectional data: they are 'snapshots' of the incomes of a large number of workers of different ages at the time of the survey. Be cautious in reading them as a 'movie' of the expected age-specific incomes of any individual (or cohort) with the stated educational attainments.

These graphs show a clear *association* between education and age-specific earnings. Those who support the human capital theory would claim that the higher earnings of the more educated workers are a *consequence* of the enhancement of worker productivity from more education. The causal relationship is not so straightforward, however. On the one hand, people are not 'homogeneous' with respect to all worker charcteristics except education. They have different abilities and capacities for work. Even if all workers had exactly the same educational qualifications, there would still be a dispersion of age-specific incomes. So part, at least, of the higher incomes associated with the more educated workers can be attributed to their personal qualities, regardless of their education.

We could go further. There are reputable economists, such as the Nobel Prizewinner Kenneth Arrow (1974), who claim that education need not have any noticeable positive effect on worker productivity, for the trends of Figures 1A and B to occur. According to his *screening* or *filter* theory, Arrow claims that

> higher education . . . contributes in no way to superior economic performance; it increases neither cognition nor socialization. Instead, higher education serves as a screening device, in that it sorts out individuals of differing abilities, thereby conveying information to the purchasers of labour.
>
> (Arrow 1974, p. 52)

An interesting aspect of the screening theory is that, from a private perspective, it does not matter whether or not education improves worker productivity – higher education will still open doors to higher paying jobs. But it does matter from a social perspective: if higher education does no more than sort out job applicants (whose abilities vary independently of education), then there is little justification for the social costs of higher education.

Those who attest to the veracity of the human capital theory, use what they call the Alpha Factor (α) to try to accommodate the interaction between personal traits and educational accomplishments. This factor attributes only a proportion (e.g. $\alpha = 80$ per cent) of extra income earned by a worker with a higher qualification to the knowledge gained in getting that qualification. The magnitude of the factor is fairly arbitrary, however, because there is as yet no way of assessing the productive effects of education independently from other characteristics of a worker (see Selby-Smith 1975, pp. 104–5).

There are two main ways in which the neo-classical economist can express the 'worth' of (human) capital investments. These are the cost–benefit (or benefit–cost) ratio and the rate of return. A problem central to both relates to time. The costs of obtaining further education are incurred in a relatively short time-span while the benefits are expected to accrue over the rest of the person's working life. Over a long time-period the 'worth' of a dollar changes. Irrespective of the effects of inflation, the promise of your receiving $100 tomorrow is more attractive than the promise of your getting the same sum ten years hence. For one thing there is a risk that you may not be alive in ten years' time. Even if that risk is negligible, you may prefer to consume sooner rather than later. At the least, if you did receive the $100 tomorrow you could deposit it and receive cumulative bank interest for ten years.

The last point gives a clue to the means by which economists translate investment costs and income benefits at differing future dates into present 'discounted' values (PDVs). They apply the inverse of the cumulative interest rate formula, i.e. the value B at a future time t of a present amount PDV, given a cumulative interest rate i, is

$$B_t = PDV(1 + i)^t$$

Reversing the reasoning, the PDV of a sum at a future date, B_t, given a 'discount' rate i, is

$$PDV = \frac{B_t}{(1 + i)^t} = B_t\,(1 + i)^{-t}$$

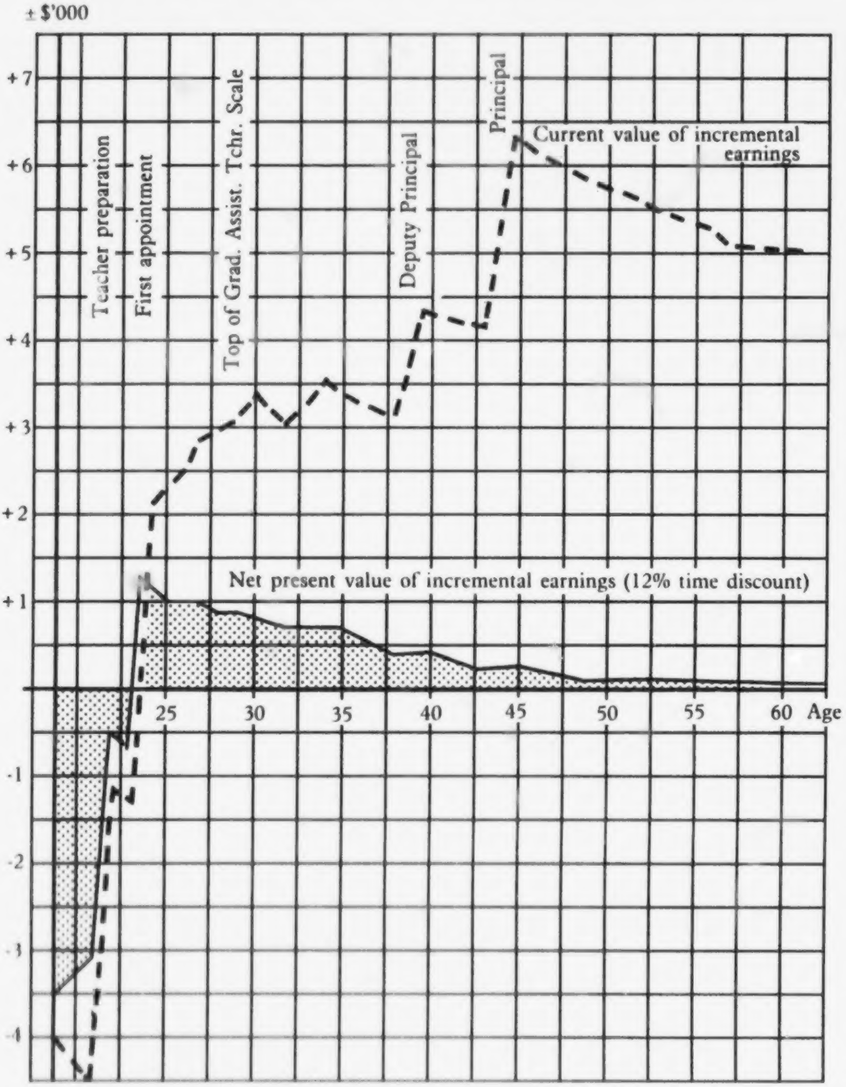
One contentious matter (involving technical and normative issues) is the appropriate discount rate to apply. One general rule is that private discount rates exceed social discount rates because both the risk element and the rate of time preference tend to be lower for a community than for an individual. One commonly accepted social discount rate is the current interest rate on long-term, 'gilt-edged' government bonds. In Australia in 1984 this rate stood at about 13 per cent.

We can now note how economists evaluate human capital investments. Basically, they ask by how much the (present value of) additional benefits exceeds the (present value of) investment costs. The result can be expressed in either of two forms: as a benefit–cost ratio, with a pre-determined discount rate; or as a rate of return – this rate being that which, when applied to all relevant benefits and costs, brings the present discounted values of both benefits and costs into equality, i.e. $B/C = 1$.

Let us take a quick example. In 1979 I evaluated a proposal by Fielding, Cavanagh and Widdowson for a five-year pre-service teacher education double-degree to be offered by Australian universities (Harrold 1979). To evaluate an investment in the program from a private perspective, I took two hypothetical matriculants – one who goes straight to work, and the other who completes a five-year degree, then begins teaching. I estimated the (post-tax) incomes of the former from published survey data and of the latter from a plausible career path and a schedule of current salaries. Study costs were incomes forgone (in relation to the matriculant worker) plus tuition expenses.

The dashed line of Figure 2 plots, in current value terms, the additional costs and benefits (with respect to the matriculant worker) expected from the investment by the teacher in the double-degree program. The area below the baseline to the dashed line represents the cumulative costs of the program, while the area above the baseline to the dashed line represents its cumulative benefits. Remember that the dotted line represents the difference in age-specific salaries between the one who has graduated and the one who has matriculated. The downward trend in the top right-hand corner results from a fixed salary of the former (as principal) and a rising salary of the latter. Clearly, total benefits are many times total costs at current values.

Figure 2: Net present and current incremental earnings from a 5-year teacher education program (12 per cent discount rate)



Source: Harrold (1979, p. 18).

The situation changes radically when we use a discount rate (12 per cent in this case) to bring each annual incremental cost and benefit back to a common time-base – that of the age of decision, 17 years. The present discounted values are plotted by the solid line and the areas representing total costs and benefits are shaded. Note that while the differential salary expectation of the graduate as principal is very high, it pales to insignificance for the 17 year old, because it is so far into the future.

For the record, the shaded area above the base line is 1.38 times that below the line. That is, the private benefit–cost ratio of investment in the 5-year degree program at 12 per cent discount rate is 1.38 – a 'profitable' investment from a private perspective.

As we have seen, the rate of return is simply that discount rate which would bring into equality the shaded areas above and below the line. In the Figure 2 case, the rate of return is 14.5 per cent – which was in 1979 a good investment. It should be said, however, that the full evaluation found the five-year program to be less attractive as a private investment than a four-year degree–diploma of education or a three-year college of advanced education diploma.

Despite the narrowness of this human capital analysis (e.g. it ignores consumption aspects of study), it does give some guidance to a pecuniarily oriented school leaver because it focuses on earnings over the whole of the person's working life, not just on starting salary.

The above case related to additional education in a specific program. Most human capital analyses are of private and social rates of return to general further education. For example Miller (1981, 1982) has used income, education and unemployment rate data from the 1976 Census of Australia to estimate the following rates of return to higher education by Australian-born males and females, using as baseline the age-specific incomes of 18-year-old school leavers. He estimated the following private and social rates (Miller 1982, pp. 27–9).

Table 1: Estimated percentage rates of return to higher education in Australia

	Private		Social	
	Males	Females	Males	Females
Diploma	16.10	16.85	12.15	11.80
Bachelor degree	21.10	21.20	16.25	15.05
Graduate diploma	17.90	17.90	13.75	12.40
Higher degree	14.55	14.80	10.75	10.10

Source: Extracted from Miller (1982, Tables 1, 2, pp. 26, 28).

The social rates were calculated by adjusting the private returns calculations by adding the tuition costs of higher education institutions and by excluding the effects of tuition subsidies and taxes from both benefits and opportunity costs. As mentioned earlier, the net effect is to lower social below private rates of return. The rates – particularly for the bachelor's degree – still look attractive.

While rates of return analyses such as Miller's have some intrinsic interest, they are no longer powerful influences on policy making about resource allocation to and within education. The use of cross-sectional data, the challenges of the screening hypothesis, the 'guesstimate' of the Alpha Factor, the narrow criteria of benefits and the questionable neo-classical assumptions about the working of the market economy, all weaken the argument that resource allocations should favour those sectors of education which show the highest rates of return.

Writers from the political economy and neo-Marxian schools would go further. They would claim that education institutions already produce a general oversupply of work skills, so that industry could function just as well if the skill-producing role of schools was cut back. Instead, they see the implicit role of schools as being not so much that of the inculcation of knowledge or skills but of attitudes – 'brainwashing' the bulk of future workers to believe that, because they were failures at school, they do not deserve more economic rewards than employers are willing to give them (Bowles & Gintis 1976). In a sense, then, the cynical neo-Marxist would argue that the lower the rates of return to sub-tertiary education, the more would capitalists want to see the sector expanded, because it would indicate the acceptance by early school leavers of low rates of pay as menial workers.

Changing concern from macroeconomic to microeconomic issues in education

As we have noted above, a major concern of educational leaders in the early post-war years was to justify the attraction of more public resources towards the education industry. These leaders welcomed the early work of economists who claimed to demonstrate that investment in human capital paid higher dividends than investment in physical capital. But as Emmerij (1974) points out, educationists were highly critical of any economist who tried to apply economic reasoning to improve the efficiency of resource allocations within the education sector itself. In his *Education and the Cult of Efficiency*, Callahan (1962) attacked all who tried to apply the narrow, hard-nosed, cost-saving approaches from private industry to education, without any real concern for the qualitative dimensions of teaching and learning.

In the financially abundant times of the 1950s and 1960s educators could afford to be relaxed about the costs of policy innovations and reforms, so long as they promised to be effective in achieving educational goals. In the 1970s, however, when costs began inflating and financial flows began deflating, they were forced to look more critically at the potential costs as well as the effectiveness of proposals for change within education.

In 1973 Jesse Burkhead openly challenged his fellow economists to swing their attention from the macroeconomic to the microeconomic issues of education:

> The incongruity is that although research on the macroeconomics of education has made important, if perhaps somewhat overrated contributions, research on the microeconomics of education has yielded almost nothing but negative

> results. If we accept, as seems indisputable, the proposition that investment in education is 'productive' for society as a whole, then it should be possible to apply microanaltyic techniques to discover those combinations of resources, decision structures, or educational practices that are more productive or less productive of specific outcomes. Unhappily, to date, it hasn't worked.
> (Burkhead 1973, p. 194)

Callahan's fears notwithstanding, Burkhead (1973, p. 196) urged that economists examine formal schooling 'as a production process in which resource inputs and decision structures for determining how resources shall be combined lead to student outputs'.

Input–output relationships

The input–output or production function research to which Burkhead was referring has long been an interest of psychologists, sociologists and educational measurement theorists, as well as econometricians. In educational studies the inputs that have been considered include the attributes of the students as well as the amounts and characteristics of teachers, administrators, other personnel, facilities and materials, while the outcome measures have focused primarily on cognitive achievement. (For a readable review of this literature, see Bridge et al. 1979, ch.2.)

There are two important problems with the voluminous input–output research to date. The first relates to its lack of a sound theoretical basis and the second to the lack of a specifically economic approach by researchers.

Virtually all of the input–output research has been in the form of empirical studies which attempt to use regression analysis to link statistically a series of inputs with a particular output measure. The inputs are usually chosen on the basis of their relative magnitude of expenditure, their appearance in other studies, their measurability, or other *ad hoc* criteria. There is an obvious lack of any sound theoretical framework from which hypotheses can be drawn to guide the selection of variables in a systematic way (Lindsay 1982, p.187). To overcome this shortcoming, Levin (1980) proposes that two theories are needed – a theory of school learning, which can structure and specify the relation of inputs to outputs, and a theory of organisational behaviour for schools, which will address the principles on which schools are organised for learning and on which resource allocation decisions are made. One does not have to agree with Levin's particular theories to accept the validity of his criticisms of the current state of input–output research.

Even if input–output research were theoretically sound, and consistent relationships could be found, the application of research findings would help only part of the economist's search for a rational basis for resource allocation within education. The second problem is that economists are concerned with value, not physical, relationships because economists are interested in maximising the value of outcomes in relation to the costs of inputs. In a complex school situation there are multiple inputs (space, equipment, teacher and administrator time, etc.) and several outcomes (academic achievement, motor skills, student attributes). While some of the inputs can be directly priced, few if any of the outputs can be.

In search of least-cost combinations of inputs, economists are interested in the possibilities of substituting low-priced for high-priced resource inputs. For example, not only are teacher services a highly priced input into schooling, but teacher salaries absorb a significant proportion of the recurrent budgets of school authorities. One would expect some substitution of less expensive support services for the more expensive teachers. Carroll (1976) analysed the changing budget allocations of large school districts in the United States of America to teachers, other professional educators, support personnel and non-personnel resources. He showed that while school districts allocated on average 33 per cent of their total expenditures to primary teachers and 28 per cent to secondary teachers, they tended to allocate only 15–20 per cent of their *increases* in budgeted expenditures to each of these teacher categories. Increased shares of discretionary budgets were allocated to lower priced non-professionals (e.g. teacher aides) and non-personnel inputs.

Carroll thus has shown that substitution does occur. But have the value of educational outputs suffered as a result? To answer that we need first, a clear specification of the nature and worth of the main educational outputs and second, an input–output function which will indicate how outputs will change in response to changes in the mix of inputs.

It is a mark of the work still to be done in input–output analyses that it can give so little guidance in policy matters such as the optimal (or best) combination of resource inputs for schools. And it is a mark of the difficulties in developing an acceptable basis for specifying and valuing outputs that there has been so little consensus with respect to what are, and what are the relative values of, the main educational outputs.

A technique called *cost-effectiveness analysis* is used to evaluate educational projects whose main ouputs cannot be valued directly in monetary terms. Essentially, the technique reports the cost per unit of achievement of a desired objective (Harrold 1982, pp. 269–82). The technique still does not overcome the problems of input–output analysis, because if decision makers disagree on what is the desired objective of the project, separate cost-effectiveness evaluations must be done, and if there is no consistent production function, there can be no firm cost per unit of achievement of the desired objective.

There is a notable hiatus between the work of economists researching education from the human capital and from the input–output (production function) perspectives. Human capital theorists have concentrated on the relationship between schooling and earnings, virtually disregarding the process through which educational inputs produce the outputs that have value in the labour market. That is, these theorists value educational outputs in terms of incremental lifetime earnings. On the other hand, input–output researchers have concentrated heavily on converting inputs into outputs in non-pecuniary forms, virtually disregarding the valuation of outputs (Weisbrod 1979). A synthesis of these two approaches would make for a more satisfying economic analysis of education – for those who accept that the human capital approach does provide a sound basis for valuing educational outputs.

Recent developments in the economics of schooling

Some economists are now coming to a clearer appreciation of why it has been so difficult to develop any rigorous, cohesive theory of the economics of education. The neo-classical theories of production have evolved from observing how inanimate resources are transformed by people and machinery in controlled production situations to produce goods and services which are sold for profit. In such situations, not only are there reasonably predictable relationships between changes in the relative quantities of inputs and the resulting products, but the nature of the inputs and outputs are known, and the incentive systems which motivate and direct worker behaviour are reasonably clear.

In education, pupils are not inanimate inputs which respond passively and obediently to 'processing' by administrators and teachers. On the contrary, they are active participants whose capacities, attitudes and efforts have a major bearing on whatever it is that educational activities produce. Furthermore, the interests and purpose of the pupils' parents also impinge on the context of learning situations in ways which actively influence the types and amounts of students' educational outputs. It is therefore not surprising that very few consistent relations have been found between physical purchased school inputs and student achievements.

The realisation by economists of the importance of personal and social factors, together with the deteriorating financial circumstances of education, have caused economic researchers (led by a group at the Educational Finance and Productivity Centre at the University of Chicago) to focus on smaller units of analysis; that is, to pay closer attention to economic aspects of the school and the classroom. In doing so they have moved away from the 'splendid isolation' of studying only financial, market-orientated activities and have entered into a dialogue with educators and other social scientists about the non-market activities of schooling. What follows is an overview of the ideas that they are currently exploring.

These economists claim that they are making a 'second generation'[3] of investigations into how educational institutions operate (Dreeben & Thomas 1980, Introduction). Their focus of study has turned towards asking what kinds of resources are available to schools and how they are allocated to and utilised by groups of students within classes and by individual students. In seeking answers to these questions, investigators have become interested in how resources come to be allocated as a consequence of administrative and educational decisions about such matters as student grouping, timetabling, teaching strategies and the choice of learning materials.

In pursuing these interests, economists are beginning to ask new questions about issues which have been the 'bread and butter' of educators: questions about exactly who it is that makes these decisions, why they are made, and what are their consequences for the distribution of learning benefits among different categories of students.

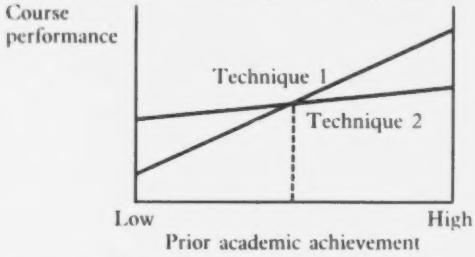
These decisions are seen to result from the values held by relevant educators and to influence the technology of the school's production process.

On the matter of values, Brown & Saks (1975) are interested in the preferences which educational administrators hold toward the distribution of learning achievements of their students. They distinguish between administrators who are 'elitist' and those who are 'levelers'. For any given level of average achievement, the 'elitists' prefer wider dispersions of achievement, with a few very good students achieving excellent results even if weaker students perform very poorly. On the other hand, the 'levelers' place high priority on minimising the dispersion of pupils around the average school achievement. This underlines the shortcomings of using average marks as a measure of the effectiveness of pupil performance, without also considering the spread of performance and the value placed on that spread.

Furthermore, educators can intentionally choose teaching technologies – lecturing, supervised group work, individual tutoring – which have differential effects on the learning of different types of pupils. In other words, decisions on what to teach and how to teach have a strong influence on who receives the benefits (Harnischfeger & Wiley 1980). Any economic study of the efficiency of teaching should therefore account for not only the improvement of learning outputs by pupils but also the values or weights ascribed by relevant decision makers to these outputs which are received by different groups of pupils.

Hansen et al. (1970) demonstrate that two teaching techniques which cost the same and generate the same average improvement in learning can have different efficiencies, if the distribution of new learning is taken into account.

Figure 3: The effect of distribution of learning on the efficiency of equal-cost teaching techniques



Source: Adapted from Hansen et al. (1970, p. 366.)

In Figure 3 students in two comparable groups are arrayed on the *x* axis according to prior learning achieved. The *y* axis measures (incremental) learning as a result of a particular course of study taught by two techniques, 1 and 2. The crossing of the two curves in the graph's centre indicates that, on average performance, the two teaching techniques are equally efficient. If, however, greater value is attached to additional learning of those with poorer prior achievement (e.g. the 'disadvantaged' students), then Technique 2 is the more efficient. The authors' claim is therefore that any appraisal of the impact of alternative teaching techniques ought to go beyond total or average effects to consider the distribution of impacts among different types of students and the value weightings attached to this distribution.

Other economists have extended their analyses into more complex issues of class management and organisation. For example, Brown & Saks (1980) have dropped the assumption that there is a single learning output called 'academic achievement' and have considered the implications of multiple learning outputs, the mix of which can be varied using different teaching strategies. Compare a lecturing approach with an inquiry approach to teaching social studies. The former will probably cover more knowledge content, while the latter will, one hopes, develop more articulate, reflective future citizens. Any determination of relative effectiveness of the two strategies for any individual student will require value weightings (monetary or otherwise) to be given to measured change in both the cognitive and affective domains. Then, if we are to consider valuing change in these domains over a number of students in a class, the problem of teaching effectiveness becomes very complex although solvable in principle.

One interesting aspect of the above problem is that usually the multiple outputs of learning are not independent, but related to each other in some way: the student who enjoys learning the facts of social studies is also likely to develop more positive social attitudes. Economists use the term *joint production* to refer to cases where the production of one output affects the production of others. In the simplest case there is a constant proportion between the products -- one can be considered a by-product of the other, as hides are a by-product of beef. In such cases we can say that each output gets the benefits of all the input: if the amount of input is increased to one product, the increase goes to all the by-products as well. In our above example, it could be that if more resources are put into increasing social studies knowledge, social attitudes would improve commensurately.

The idea of jointness extends to teaching a group of pupils. If the learning of each is considered an output, then in applying teaching inputs to a class, one pupil's learning benefits can be obtained without reducing the learning benefits received by others. This phenomenon is similar to the notion of *public goods*, which was mentioned earlier. Just as the reception of a radio broadcast by one listener does not limit the reception by another, so does the listening of one pupil not reduce that of others in the class.

Brown & Saks (1980) are using these notions as a basis for comparing the effects of alternative teaching strategies on pupils' learning outputs. If the time a teacher spends in a class period is fixed, that time can be allocated to teaching the class as a whole (where the public good nature of learning obtains) or on personal tutoring (where learning becomes a private good, with the more time allocated to a single student resulting in less time available for the learning of others) or to some combination of class and individual teaching. The challenge to the economist of schooling is to consider principles by which a teacher might allocate classroom time and other resources among strategies and student groupings in order to optimise class learning. An extension of this challenge is to consider the economic implications of organising pupils into classes (e.g. by random assignment or streaming) given a particular set of teaching strategies (Brown & Saks 1980, pp. 85–7). In this development the analyst is faced more directly with the possible interactive effects (for good or ill) among students on their motivation to learn (i.e. to put effort and time into their studies).

This touches on one further topic as being a current interest to the economists of schooling – the allocation of time.

The time of administrators and teachers has always been recognised as an important resource in schooling, because the salaries paid to purchase this time absorb a large proportion of the budgets of educational authorities. Even so, there are only a few descriptive or analytical studies of the allocation of educator time within schools. Sturman (1982, ch.7) has conducted one of these. There is a rich field of investigation for researchers to view the school timetable as the main tool by which teacher time is allocated among students of different year-levels and academic abilities.[4] The timetable notation schema of Davies (1969) provides a promising basis for analysis in this area.

The real challenge is in studying the allocation of students' own time. This aspect of resource allocation has often been overlooked because it is 'free' in the sense that it involves no explicit outlays by educational institutions. In another sense, however, student time is valuable. Because its 'stock' is limited, it must be spent (since it cannot be stored) and it can be spent in a variety of ways. The International Education Association studies have shown that there is a positive correlation between time spent on studying a subject and achievement in that subject (Keeves 1975). Thus the 'real cost' of more time spent studying one subject is the learning forgone by spending less time on one or more other subjects.

In the early 1980s the matter of the limited stock of student time was the focus of widespread discussion in the United States of America. It was found that the average American student attended school for 6 hours a day for 180 days a year. This compared with other industrialised countries such as the United Kingdom where academic secondary students often attended school for 8 hours a day for some 220 days a year (National Commission on Excellence in Education 1983, pp. 21–2). If this is so, then after 12 years of schooling, students in other countries have had an equivalent of up to 4 years' more time in school than US school leavers!

If there is a positive correlation between time spent teaching subjects and students' academic achievement, then an extension to the length of the school year seems an obvious means to improve the academic performance of the nation's children. Lest it be believed that this reasoning is limited to the United States of America only, Lachlan Chipman, President of the Australian Council for Educational Standards, has proposed that the Australian school day should be lengthened by 40 minutes to ensure that basic literacy and numeracy skills are taught adequately to children (*Courier Mail*, 27 June 1983). In economic terms, the opportunity costs of the use of learning time would be reduced by increasing its stock.

The economist H. M. Levin has shown however that,

> as compelling as the logic and evidence might appear, the consequences of increasing the time allocated to schooling and making its use more effective are hardly as straightforward or as effective in improving achievement as they have been advertised.
>
> (Levin 1983, p. 3)

Levin distinguishes between increasing the availability and increasing the actual use of time as a resource. Just as 'you can lead a horse to water but you can't make it drink', authorities can keep pupils in school longer but they cannot necessarily make them learn more during the extra time.

Behind this distinction is our earlier appreciation that students are not passive recipients of teaching services; they are active participants whose own resource allocation and use decisions have a primary impact on learning effectiveness. It is an important role of the teacher to provide the incentives and motivations to encourage students not only to allocate and use their learning time resources effectively during school hours, but also to extend their learning time beyond school into homework.

It is interesting to note that Charles Benson, the author of one of the most widely read texts on the economics of education (Benson 1978), has led a major research project, 'The children's time study', which looks closely at the family factors that seem to affect students' allocation of their out-of-school time (Benson et al. 1980). Benson et al. saw their research within the lineage of modern human capital theory which considers capital accumulation by families, rather than individuals. Within a theoretical framework of the intergenerational transmission of human capital (neo-Marxists would interpret this intergenerational transmission within the theoretical framework of social reproduction), they were interested in how the adult members of a family allocate their (scarce) time to the homework of selected children in order to maximise the chances of academic success and ultimately career opportunities. Within this framework, the parents' purpose is seen to be the maximisation of the lifetime income potential of the whole family.

Thus in their study of children's homework decisions, Benson et al. (1980) have provided a nexus between the developments in the human capital approach to the study of education and the microeconomic study of the process of schooling. They saw the interactions between parents and their student children as being set within long-term incentive structures provided by the parents' knowledge of the relation betwen academic success and life opportunities for their children. From a survey of 764 children aged 11 and 12 years in Oakland, a working-class suburb of San Francisco, they found that parental inputs to their children's learning (via help with homework, working at hobbies and eating together, etc.) does matter–but in a particular way. While the level of parental input in low socioeconomic families does not seem to increase the proportion of high achievers, it *does* reduce the proportion of *low* achievers. This gives us a somewhat more sophisticated understanding of the influence of family factors on a student's allocation of study effort and consequent school achievement.

The influence of policy making on the economics of schooling

There is no cohesive theoretical structure within which economists study schooling. The process is too complex, the purposes too multifarious and the opportunities for measurement too few. All one can say is that to date there has been no more than a series of explanatory research thrusts at different levels of aggregation, at different sectors of the education system, and using different methodological approaches. The findings which have emerged so far have been few, fragmentary and have had little direct impact on policy making within the educational system.

This is not to say, however, that economic arguments have neither been accepted by nor permeated the thinking of those who make policy. The survey work of Carol Weiss has shown that while policy makers in Washington DC claim that they rarely, if ever, make direct use of social science research, they nevertheless are influenced in the way they conceptualise issues and deal with policy (Weiss 1977). Nowadays, for example, it would be unusual for policy makers not to include the full (monetary and non-monetary) cost implications of important policy proposals. And, as a result of the work on human capital, most policy makers would appreciate that the impact of education on graduate earnings is gauged better by the use of discounted lifetime earnings than by, say, starting salaries.

Since there is unlikely to be much interest in basic theoretical research into the economics of schooling, future research is likely to continue to be empirical and problem oriented, with the agenda set largely by those educational authorities which are willing and able to sponsor research. One of the few such Australian authorities is the Australian Educational Council (AEC). In 1978 the AEC commissioned the Australian Council for Educational Research (ACER) to undertake a descriptive analysis of the staffing and resources employed in government school systems in the six Australian states, the Australian Capital Territory and New Zealand. The resulting reports (Ainley et al. 1982; McKenzie & Keeves 1982; Ainley 1982; Sturman 1982) and the reports of the Victorian Department of Education's School Resource Allocation and Management Project (Charlton 1979) added considerably to empirical knowledge of resource allocation in Australian government schools.

Undoubtedly, the policy makers with the greatest interest in commissioning economic studies of education in Australia reside in Canberra. The greater involvement of the commonwealth in state education activities has coincided with a relative decline in the growth of governmental revenues and an upsurge in demands placed on public resources by other social functions such as hospitals and welfare services. Members of the Commonwealth Schools Commission (CSC) and the Commonwealth Tertiary Education Commission (CTEC), who make policy recommendations to the commonwealth government regarding education, are continually seeking economic advice. Indeed, the inaugural chairman of the CTEC, P. H. Karmel, was previously Professor of Economics at the University of Adelaide, and the 1984 Chairman, Hugh Hudson, was a senior lecturer in economics at the same university.

One interesting characteristic of commonwealth educational authorities is that, apart from the provisions of Clause 51 (XXIIIa) of the Australian Constitution[5], the commonwealth government lacks the legal authority under our federal system of government to intervene directly in the administration of state educational institutions. Its main source of power derives from Clause 96 of the Constitution:

> . . . the [Commonwealth] Parliament may grant financial assistance to any State on such terms and conditions as the Parliament thinks fit.

Commonwealth authorities must therefore seek to achieve their policy purposes by the conditions they attach to so-called 'specific purpose grants'. Prevented from using direct, constitutionally sanctioned directives, the educational authorities of the commonwealth government commonly attach conditions to grants which are designed to provide incentives for state authorities to behave in ways consistent with commonwealth purposes.

An area of considerable interest among econometricians is the design and impact of incentive structures written into intergovernmental grants. The leading researchers in this area, most of whom come from the United States of America, include Barro (1978), Gramlich (1977) and Levin (1981). In Australia, some econometric analysis has been carried out by Blackburn (1983), and Hind (1979) has evaluated the arguments for and against commonwealth grants using the theory of public choice literature. Hind's paper is one of a number of works commissioned by the Centre for Research on Federal Financial Relations (see, for example, Matthews 1983).

Full-time commissioners of the CSC have contributed to an ambitious ten-nation study by the Organization for Economic Co-operation and Development (OECD) into the use of various 'financial instruments' designed to achieve the educational policy goals of central authorities (Centre for Educational Research and Innovation 1979). The analytical purpose of this exercise was to study the countries' diverse approaches to the use of financial and other incentives designed to pursue particular ends, such as equality of opportunity, decentralisation of decision making, and the encouragement of innovation. While it was not fully successful (Sherman 1978), the study is likely to be followed by others which aim at making inter-country comparisons of financial incentive structures which are designed to achieve central governments' policies in federal systems.

In its enabling Act, *Schools Commission Act* 1973 (No.213), Clause 4(h), the CSC is charged with 'the need, in relation to primary and secondary education and in schools and school systems, to promote the economic use of resources'. Consistent with this objective, the commission has recently undertaken a detailed review of the current state of knowledge about the effectiveness of resource allocation in education. Called the Target Recurrent Resource Standards Study, it has sought to identify 'the most effective ways in which recurrent resources might be applied to schools and thus to develop recommendations on the levels of resources necessary to provide all students with schools of adequate quality' (Commonwealth Schools Commission 1984a, p. 6). The policy intention of the study was to provide an analytic and descriptive basis for making recommendations to the commonwealth government on the funding of government and non-government schools. Its notion of a 'community standard' of schooling was in fact incorporated into the guidelines for commonwealth funding of schools, announced by Senator Ryan in August, 1984.

As a by-product of this exercise, this study has generated a valuable set of authoritative empirical studies of resource allocation to and within Australian schools. Its own Schools Resources Studies (Commonwealth Schools Commission 1981, 1983) have provided detailed data on the composition of costs of government schools. This together with the 1982 ACER studies (Ainley et al. 1982; McKenzie & Keeves 1982; Ainley 1982; Sturman 1982) and the further investigations it commissioned (Angus et al. 1983; Burke 1984; Coulter 1983; Lenahan 1983a, 1983b), describe more fully than ever before the 'story' of differences in school costs among various types of schools in Australia. It is hoped that the availability of this data will encourage economists to investigate the 'plot' of why these costs vary as they do, and, in doing so, to extend the fund of theoretical knowledge of the economics of schooling in this country.

The *Schools Commission Act* also directs the commission to recommend funding levels for non-government schools. We might expect that economic analysis could help clarify some of the issues in this very contentious area of the commission's activity. We could ask, for example, whether or not additional aid for non-government schools would increase the overall efficiency of our schooling system.

A 'knee-jerk' response of neo-classical economists would be to reply in the affirmative. If government schools act as monopolistic providers of education, then more competition from non-government schools would force the former to be more efficient, to provide a greater choice among themselves and to stimulate more innovation. Hirschman (1970) would argue differently. Combining political science with economic reasoning, Hirschman argues that a small non-government sector provides an 'exit option' for parents who have unsuccessfully protested about the perceived poor quality of their children's education in government schools. To the extent that the concerned, articulate parents withdraw their children, the monopolistic intransigent government schools in fact are 'coddled' and have fewer pressures to become responsive to their constituents.

It would be tempting for economists to compare the efficiencies of government and non-government schools of similar size, resource levels and community background. For if one type were found to be more efficient than the other, then transfer from the less to the more efficient would improve overall efficiency.

Willms (1984), an educational statistician, has reanalysed survey data obtained for the Coleman Report (Coleman et al. 1982) on public and private schools in the United States of America. He found that the diversity of achievement of pupils of similar ability and socioeconomic background, within each school type, greatly exceeded any differences in average achievement of comparable pupil groups across school types. In other words, the range of effectiveness of schools within each school type is very much more significant than the difference in effectiveness between school types.

Any economists who attempt to compare the effectiveness or efficiency of government and non-government schools in Australia must be very careful about their assumptions. For example, an input–output study of efficiency could obscure the ways in which school processes interact with the choice of students (or parents) to attend non-government, rather than government, schools. There are at least two possible causes of such interaction. First, parents who choose a non-government school for their child are expecting to choose a set of classmates who are well motivated and who will contribute to the child's own education. Second, the ability of non-government schools to dismiss disruptive, poorly motivated students, is likely to ensure a climate which is more conducive to learning.

Indeed, differences in the motivations of parents in sending their children to the different types of schools, and in the purposes which the schools see themselves pursuing, suggest that the school types could have different social and educational roles to play. If this is so, then any attempt to compare efficiencies using conventional input–output techniques would be both inappropriate and misleading.

Thus economic analysis would be of little assistance to the CSC in guiding policy recommendations about any 'optimal' balance between government and non-government schools in Australia. Inevitably, any solution to such issues must be primarily political – with all the lobbying and public persuasion that lie behind political policy making.

Future directions of the economics of schooling in Australia

It is unlikely that the study of the processes of schooling will become a popular field for economic research. In the immediate future, therefore, it is not likely that there will be many exciting, important new discoveries or theoretical insights by economists in schooling. The field is simply too complex and the tools currently available to economists are too crude.

The directions of the economics of schooling will primarily be determined by government bodies who seek analytical assistance in clarifying policy issues and providing relevant information. In consequence, the future development of the field will tend to be fragmented and largely empirical.

Moreover, the future work of economists lies more in their working as members of multi-disciplinary teams than as independent experts. For the more economists come to study resource allocation at 'disaggregated' levels – in the school and the classroom – the more they will have to move from the isolation of their own discipline and to collaborate with educationists, psychologists and members of other social science disciplines.

An afterword: Some reflections on evolutionary dynamics

The Darwinian notion of evolution as 'the survival of the fittest' is based on the idea that those who are strongest and best adapted to their environment are those who contribute most to succeeding generations.

I have been discussing the environment of the evolving ideas in the economics of schooling on two levels – from within one (neo-classical) school of thought and among different schools of thought. Within any one school adherents share a common perspective on the nature of schooling, on the economic issues and on the analytical approaches to studying the issues. Through debate and critical writing, members goad and stimulate each other to develop and strengthen their analyses. Theoretical evolution proceeds largely internally.

While there is much conflict across schools of thought, the arguments themselves rarely threaten the survival of one school relative to another. The assumptions which underlie the various frames of reference, the modes of theorising and the *modus operandi* of members of the opposing schools differ so fundamentally that arguments tend to become 'stand-offs' with all sides 'agreeing to disagree'.

This does not mean, however, that there is not an evolutionary mechanism which affects the survival potential of the different schools. Rather it means that academic debate is not a strong determinant of the survival rates of schools of thought. The evolution of schools of thought depends more on their acceptability by, and their adaptability to, the needs of 'the public environment'. In part, 'the public' comprises those educators and educational administrators who find the ideas and analyses of one school more salient and more useful in giving them insights into, and prescriptions for solving, the daily problems they face in making decisions and policies. In greater part, 'the public' comprises those pressure groups who find that the theories and research findings of a particular school provide the 'facts' and the support they need to push their political interests (Cole et al. 1983, p. 15). An obvious case was the human capital theory of the neo-classical school which was grasped and used to advantage by educational lobby groups in the 1960s and early 1970s. Its fall from favour with these groups can be traced to two factors: first, to 'internal' criticism of the theory itself – even by previous exponents (Blaug 1976); but more importantly second, to the recession in employment and in government funding which made futile, arguments for preferential funding for education based on its being a 'sound investment'. While neo-classical writers still use rates of return analysis, they do so out of the intent to influence other academics of their own school of thought, rather than with any hope of influencing policy makers.

It is certainly not my intention to leave you cynical about schools of economic thought on education – sceptical, yes; but cynical, no. I maintain that a healthy scepticism towards particular theoretical arguments in economics – or any other social science – is a hedge against gullibility. Theories, from whatever school of thought, are essentially speculations. So how do we test these speculations? Lave & March (1975) use three criteria – truth, beauty and justice. Firstly, does the theory give the best explanation of what is happening? How well do the assertions from the theoretical model accord with our own observations? Secondly, is it satisfying in its simplicity? That is, does it help us to lose a lot of detailed information in order to gain a fundamental understanding of a few key factors in a problem? Does it give us new ways of thinking about old problems? Thirdly, will the application of policies based on the theory make the world a better place?

These questions make explicit a checklist of criteria which we implicitly apply to ideas, as individuals and collectively as a society. Those schools of thought are likely to prevail whose theoretical ideas and empirical research findings bring positive public responses to these questions.

But, in reality, people are not concerned wholly to support one school of thought above another. Rather, they want to select and use whatever ideas, from whatever school, which serve their particular purposes best. For an appreciation of resource allocation problems within schools, neo-classical techniques could be more appropriate. For an understanding of the political and socioeconomic context of the whole education enterprise, the neo-Marxist analysis could well be the most helpful.

Caldwell (1982, p. 250) claims that, since there is no single optimal methodology in economics, it is best to be conversant with a number of schools of thought, so that we can be 'methodological pluralists'. That seems good advice.

Notes

1 Note that to the economist education is not the only human investment activity. Migration from a location where labour productivity is low to where it is high can be considered an investment in human capital. Again, activities which ensure the health and vitality of workers can be considered an investment in (or at least can offset the depreciation of) human capital.

2 Increased human capital also enhances the production of private things which do not lead to market transactions. My increased literacy enables me to read and enjoy a wider range of interesting novels. Economists have no direct way of valuing the worth of these enhanced 'consumption benefits' from human capital. They tend to evaluate the returns to educational investment with marketed benefits, and treat the non-marketed benefits as 'icing on the cake'.

3 The 'first generation' were the input–output studies which sought to identify educational resources whose variation might account for differences in educational achievement. The main shortcomings of these studies were that their average relationships assumed that all students were homogeneous, and that they abstracted equally from the process of schooling.

4 Harrold & Roberts (in press) employ a 'break-even class size' model to bring about a nexus between the curricular arrangements of any non-government school and its financial operations.

5 This is the so-called 'benefits to students' clause. While it has to date been used only to authorise the payment of financial assistance to students (e.g. under TEAS) some (e.g. Birch 1975) believe it could be used by the commonwealth in an attempt to gain plenary powers over state education.

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Readings

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Economics against education

J. Burkhead

Just twelve years ago last December, Professor T. W. Schultz delivered his presidential address to the American Economic Association on "Investment in Human Capital." This "rediscovery of the human agent" initiated a substantial body of research in a macroeconomic approach to investment in education. It included the work of Becker, who estimated the rate of return on college education for white urban males, using discounted lifetime earnings, and who found the rates to be somewhat higher than for investment in physical capital in the United States manufacturing industry.[1] Schultz and others explored the relationship between the investment in education and the total output of the economy, and measured the stock of educational capital and the relationship of education to productivity changes.[2] In the early 1960s, attention to human capital formation began to enter the literature and affect policy for economic development.[3] Educational planning is now a respectable component of the multiyear plans of many developing countries.

It is not difficult to understand why the enthusiasm for an examination of the macroeconomics of education has enjoyed such popularity, particularly in this country. To begin with, it harmonizes conceptually with contemporary growth theory. Solow had discovered as early as 1957 that there was a long-run trend toward declining capital output ratios in the American economy. That is, increases in output could not be explained wholly by increases in the stock of physical capital per worker.[4] Later, in his significant work on economic growth, Denison assigned 25 percent of the growth in the United States economy to formal education and 15 percent to a residual labelled the "advance of knowledge."[5]

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[1] Gary S. Becker. *Human Capital.* New York: Columbia University Press, 1964.

[2] See Theodore W. Schultz. *The Economic Value of Education.* New York: Columbia University Press, 1963; Theodore W. Schultz. *Investment in Human Capital: The Role of Education and of Research.* New York: Free Press, 1971, for a review of the major research contributions.

[3] See, for example, Herbert S. Parnes. *Forecasting Educational Needs for Economic and Social Development,* The Mediterranean Regional Project. Paris: Organization for Economic Cooperation and Development, 1962; Frederick Harbison and Charles A. Myers. *Education, Manpower, and Economic Growth.* New York: McGraw-Hill, 1964.

The findings about the importance of education also fit very well into the behavior patterns and the ideology of the citizenry. As is widely known, the income elasticity of expenditure for education is well in excess of 1.0—as family income rises, increasing amounts are spent, publicly and privately, on the education of children. And education has long been regarded, and in some circles continues to be regarded, as a virtual panacea for all manner of ills. The first important federal aid program for education—the National Defense Education Act of 1958—was enacted in direct response to the Soviet Union's Sputnik challenge. We might as reasonably have concluded that the Russians got into space earlier than we because they captured better Germans, but in our collective wisdom we decided that math, science, and language programs ought to be strengthened. And, of course, this preoccupation with education as panacea continued into the Great Society period when we fervently hoped that additional funds poured into inner-city schools would somehow eradicate poverty. The American love for education is probably rivaled only by the American love for the motor car.

None of the foregoing is intended to deprecate the research on the macroeconomics of education or the public programs it has encouraged. Useful work has been done and useful programs have resulted, even though the outcomes have not always been as impressive as might be hoped. It is inevitable that there will be continued research in this area. In every country, developed or less developed, substantial resources are devoted to education, and it will be important for economists, educators, planners, and budget officers to analyze as best they can the relationship of investment in education to economic growth, the trade-offs among investment in education, health, and welfare, and the trade-offs between investment in physical and in human capital.

The incongruity is that although research on the macroeconomics of education has made important, if perhaps somewhat overrated contributions, research on the microeconomics of education has yielded almost nothing but negative results. If we accept, as seems indisputable, the proposition that investment in education is "productive" for society as a whole, then it should be possible to apply microanalytic techniques to discover those combinations of resources, decision structures, or educational practices that are more productive or less productive of specific outcomes. Unhappily, to date, it hasn't worked. Formal schooling is not all of education, to be sure, but it is an important part of it. The efforts to analyze formal schooling as a system have not, as yet, been useful for policy purposes.

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[4] Robert M. Solow, "Technical Change and the Aggregate Production Function," *Review of Economics and Statistics*, August 1957, pp. 312-323.

[5] Edward C. Denison. *The Sources of Economic Growth in the United States and the Alternatives Before Us*. New York: Committee for Economic Development, 1962.

Last year the Rand Corporation prepared, for the President's Commission on School Finance, a careful survey of research findings on five different approaches to school effectiveness.[6] The authors identified these as (1) input-output, the economists' type of systems analysis; (2) process, largely the work of psychologists and sociologists; (3) the organizational approach used by political scientists and sociologists, consisting of specific case studies of schools in their environment; (4) the evaluation techniques that have been applied to large programs such as Head Start; and (5) the experiential approach, represented in the writings of Friedenberg, Holt, Kozol, Goodman, Herndon, and others. The authors concluded that:

> Research has found nothing that consistently and unambiguously makes a difference in student outcomes.[7]
>
> Increasing expenditures on traditional educational practices is not likely to improve educational outcomes substantially.[8]

Christopher Jencks, in his controversial volume *Inequality,* reports:

> . . . no measurable school resource or policy shows a consistent relationship to schools' effectiveness in boosting student achievement. The specific school resources that have a "statistically significant" relationship to achievement change from one method of analysis to the next, from one sort of school to another, and from one type of student to another. While it is always possible to invent explanations for all this after the fact, it is never possible to predict much about such differences in advance.[9]

The macroeconomics of education can be defined with reasonable precision as the consequences of education on such aggregates as output, economic growth, and income. The microeconomics of education will be defined here as the production of education. The body of research it entails is variously called input-output, systems analysis, effectiveness analysis, or production function research (and some aspects of program budgeting in education are closely related). In between there is a body of research that utilizes microeconomic tools to examine such questions as the relationship of education to unemployment, to labor force characteristics, and to labor migration.

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[6] Harvey A. Averch, Stephen J. Carroll, Theodore S. Donaldson, Herbert J. Kiesling, and John *Pincus. How Effective is Schooling?* Santa Monica: Santa Monica, Calif.: Rand Corporation, 1972. See also the study by James W. Guthrie, "A Survey of School Effectiveness Studies," in Don Davies, ed. *Do Teachers Make a Difference?* Washington, D.C.: U.S. Office of Education, 1970, pp. 2

[7] Averch et al., *op. cit.*, p.x.

[8] *Ibid.*, p. xiii.

[9] Christopher Jencks et al. *Inequality: A Reassessment of the Effect of Family and Schooling in America.* New York: Basic Books, 1972, p. 96. This writer does not concur with all of Jencks's statistical techniques and conclusions. For a balanced judgment on this interesting volume, see Henry M. Levin, "The Social Science Objectivity Gap," *Saturday Review,* Vol. 55, December 1972, pp. 49-51.

For present purposes this intermediate type of research will not be examined. Attention will be directed to efforts to examine the production of education, which is a straightforward effort to apply conventional economic tools to formal schooling. Formal schooling is examined as a production process in which resource inputs and decision structures for determining how resources shall be combined lead to student outputs. Schooling, then, is viewed as a production process in much the same way that economists have traditionally viewed the production activities of an individual firm in the private sector. It may well be that this approach simply represents another effort on the part of economists, well known for their arrogance, to impose their tools of analysis on a sector that does not fit the economists' models.[10] On the other hand, almost every social scientist, unless he is a mystic, has at least some belief in systems analysis. Schools, like other institutions, do have inputs, decision structures, and outputs. It should be possible, in a moderately rational world, to trace these relationships. The remainder of this paper will be devoted to an assessment of the present state of research on the production of elementary and secondary education and to an attempt to suggest some new directions that might bring modest rewards.

Production Functions The most simplistic formulation of a production function is: $0 = f(n,k,a)$, where output is 0 and n, k, and a refer to specific quantities of inputs in terms of labor, capital, and land. For any specific firm or industry, the estimation of a production function consists of the specification of the functional relationships that obtain among factor combinations, either at a point in time or over time. As applied to education, it has been customary to expand the set of functional relationships to include such independent variables as school resources, measured in terms of per pupil expenditures, class size, and teacher characteristics; socioeconomic characteristics of students, such as family income, housing conditions, or parental occupation; and, in some analyses (Coleman, for example), peer group influences.

Output is typically taken as cognitive achievement on reading tests, or possibly IQ or quantitative examinations. Some other measures of output have been used, such as the "holding power" of a school as measured by dropout rates.

The survey by Averch and others examined nineteen such microeconomic studies. There were, of course, important differences in the selection of the independent variables and some differences in statistical techniques. Multiple regression analysis is most commonly employed, but some researchers have used two-stage least squares and simultaneous equation models.

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[10] Some educators will take the position that the best way to improve schooling, particularly for inner-city pupils, is to concentrate on hot breakfasts, hot lunches, and improved dental and medical care, and believe that resources utilized here are certain to yield better results than resources spent on the economic analysis of schooling. This is surely a defensible point of view but one that economists are not likely to embrace unless it can be demonstrated systematically.

The generally negative conclusions of the Averch survey have already been indicated. Invariably it is discovered that out-of-school influences are more important on learning than in-school influences. Coleman found peer group influences to be significant. Others have found that the socioeconomic characteristics of the students and their families and neighborhoods are most important. Sometimes, in some studies, teacher characteristics emerge with a statistically significant influence on student outcomes. But here one suspects that some multi-colinearity has crept in; more experienced teachers probably move to higher income schools where more learning takes place, and would take place even if the teachers had not transferred.

The discouraging conclusion from almost all of these research efforts is the failure to isolate in-school influences. With output measured in cognitive terms, class size appears to be unimportant,[11] per pupil expenditure is relatively unimportant, and various resource combinations, such as additional expenditure on textbooks, on the library, or on guidance counselors, appear to be unimportant. The policy parameters (resource combinations) that are within the control of school administrators do not appear to count for much.[12]

It is possible that this rather large body of research has produced such unimpressive results largely because of data difficulties. Economists, of course, would prefer to work with data that had been generated for the purposes at hand, not with data generated for other purposes. But it is the latter, not the former, that is usually employed. Thus the microeconomic studies are usually cross-sectional, not longitudinal, whereas education is surely a process that occurs over time. There are other data difficulties that may be summarized briefly.

First, output measures, even of cognitive skills, are faulty for purposes of economic analysis. Most of the testing that is done in schools is for purposes of guidance counseling or perhaps for tracking. What the economist needs are measures of cognitive skills—verbal and quantitative—that will reveal value added by the school. This would require that the same standardized test be given in the fall and in the spring, and that the same test (or one of identical difficulty) be given to ninth-grade students and to twelfth-grade students. In some school systems, reports on the proportion of students in the sixth grade who read at sixth-grade level is a useful step in this direction.

Secondly, on the input side, data are hopelessly inadequate on various at-

[11] This finding is disputed by almost every classroom teacher in the nation.

[12] In Jesse Burkhead, Thomas G. Fox, and John W. Holland. *Input and Output in Large City High Schools*. Syracuse, N.Y.: Syracuse University Press, 1967, an effort is made to separate the influence of total resources available to schools, measured in terms of per pupil expenditure, from what are labelled the "process" variables--the factor combinations--that are possible within a given school. The results were still very largely negative--out-of-school influences overwhelmed the in-school influences on cognitive outputs.

tributes of student time, which is, without doubt, a quantitatively important resource. No measures are available of the amount of homework, time spent in study-halls versus time in the classroom, and the relationship of extracurricular activities to the curriculum. Neither are there good measures of teacher time and guidance time.

As for resource combinations within the school, data on average class size are seriously misleading, and there is no good information on capital/labor ratios for specific schools or programs within the school. The comprehensive high school that offers vocational education, which is more expensive than general education, is particularly difficult to analyze in terms of cognitive outputs in relation to the cost of inputs. Finally, researchers have not agreed on the appropriate unit for analysis. Are we interested in the production of education for the school district, for an individual school, for a specific program (language arts, mathematical skills), for a classroom, or for the individual student?

There are some other problems with data that appear to be virtually intractable. The inner-city school with very high rates of pupil turnover—in some cases measured at more than 100 percent of the fall enrollment—is clearly not sufficiently stable to permit any kind of systems analysis. Comparable instability obtains where teacher turnover rates are very high, or where substitute teachers are in the classroom more than a small fraction of the year. And, of course, there are the cases where learning is not the objective function, but where discipline, order, and the reduction of vandalism are the outputs of the educational system. A particular bit of irony occurs where difficult students are either expelled or encouraged to drop out of school. This will inevitably raise average test scores for those who remain, since the dropouts are typically the weaker students.

Apart from the data problems, which will continue to be serious, there are also some conceptual difficulties in the microeconomic analysis of education. In the estimation of production functions in the private sector, it is assumed that a factory manager, for example, has reasonably good knowledge of the marginal productivity of the factors that he utilizes, and thus he is able to optimize factor combinations to maximize profit. But in elementary and secondary education there is no reason to assume that a school principal, or district superintendent, or board of education has knowledge of or interest in the marginal productivity of resource inputs. Even if these were known, it could not be assumed that it would be possible to secure least-cost combinations, given the institutional rigidities of mandates and conventional practice. Neither is there a reasonable substitute for the objective function of profit maximization. Thus the optimization rationale that underlies production functions in the private sector is inapplicable for elementary and secondary education.

The absence of a realistic optimization assumption indicates a truly fundamental difficulty: very little is known about decision structures within elementary and secondary education. The "black box" of operations research—the intermediate stage between inputs and outputs—has never been opened. Therefore, the economist does not know very much about objective functions that principals or superintendents may be seeking to maximize. And surely this varies from school to school. One principal may be more interested in the happiness of his staff than in the cognitive learning of students. Another may be more interested in a winning football team. The superintendent is always interested in securing approval for his budget or in bond issues that must be ratified.

The conceptual problems on the output side have been well explored in the literature.[13] Part of the difficulty, as we have seen, is the absence of information on the administrator's objective functions. But beyond this, although there is general recognition that noncognitive outcomes affect cognitive outcomes, no satisfactory technique has been devised for parcelling out the two types of outcomes or specifying an appropriate joint product of cognitive and noncognitive skills. Motivations, learning styles, and socialization are important dimensions of formal education and may be more important to the totality of in-school and out-of-school education than the cognitive domain as such.

Given the present status of the microeconomic analysis of education, it is difficult to disagree with the conclusion reached by Levin:

> In this paper we have asserted that such studies [production functions] suffer from theoretical and econometric deficiencies that are so severe that their recommendations may spawn greater inefficiencies in the production of education.[14]

However, it may be possible to glean something from the frustrations of previous efforts. Certainly the problems are important enough to be worth the effort; education is the nation's second largest industry.

One possible direction is operational—further experimentation with program budgeting (PPB) in education. Program budgeting is policy oriented in that it seeks to relate the costs of inputs to specific outputs or goals within an organizational context. Another possibility is to organize a different kind of interdisciplinary systems research than has yet been attempted.

PPB in Education In its recent applications in general government (federal, state, and local), program budgeting has had three major purposes: (1) the quantification of outputs; (2) the analysis of optimum resource combinations for attaining specified outputs (objectives, goals); and (3) the provision of a basis for multiyear planning. Some PPB enthusiasts will insist that it is the only way by which programming can be linked with budgeting. Some will insist that it is an administrative procedure for the decentralization of authority, although in all government agencies where it has been installed, it appears to have quite the opposite consequence: PPB becomes a procedure for centralizing budget decision-making.

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[13] Averch et al., *op. cit.*, pp. 16-18, 35-36.

[14] Henry M. Levin, "Concepts of Economic Efficiency and Educational Process," National Bureau of Economic Research, Universities NBER Committee, Chicago, 1971, p. 35, unpublished.

Government agencies have been experimenting with an output approach to budgeting off and on since the turn of the century, but public education remained untouched by these efforts until recently. Dade County, Florida, whose experience goes back only six or seven years, was probably the first major school district in the country to do serious work in this area. Hartley's 1968 volume lists only about six efforts.[15] However, in the last few years, for a variety of reasons, there has been a sharp acceleration of professional interest and of operational experience in this area.

PPB in education has an appeal for the advocates of economy and efficiency. It has an appeal for those who would improve education by way of stronger managerial control at the top. And, of course, it has an appeal for those who feel that systems analysis will resolve all problems.

Beyond these generalized interests in PPB for education, there have been some specific stimulants. Here, of course, history starts with the alleged success in the Department of Defense of cost-effectiveness analysis in the early 1960s, followed by federal government-wide adoption of PPB in August 1965 (and its recent deemphasis). The State-Local Finances Project, directed by Selma Mushkin and supported by The Ford Foundation, encouraged the installation of PPB systems in five states, five counties, and five cities. The project's documents, which were widely disseminated, included attention to the applications of PPB in education. In 1968, the Research Council of the Association of School Business Officials (ASBO) subsidized eight pilot projects in PPB. Also in 1968, the California Advisory Commission on School District Budgeting and Accounting, California State Department of Education, provided funds for six pilot projects in PPB in that state, and out of this experience a modest PPB format has been adopted for all school districts in California to be initiated in the near future.

In addition, the NEA School Finance Conference has devoted many sessions to PPB. A number of management consulting firms have been involved; Peat, Marwick, Mitchell & Co., for example, provided consulting services to the pilot projects in California, and in 1969 Rand published *Program Budgeting for School District Planning: Concepts and Applications.* Neither have the academics been far behind. In addition to Hartley's 1968 contribution, Hirsch, Marcus, and Gay published *Program Budgeting for Primary and Secondary Public Education.*[16] Alan Thomas' volume on the systems analysis of education closes with a brief section on PPB as the technique that "puts it all together."[17]

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[15] Harry J. Hartley. *Educational Planning-Programming-Budgeting.* Englewood Cliffs, N.J.: Prentice-Hall, 1968.

[16] Werner Z. Hirsch, Morton J. Marcus, and Robert M. Gay. *Program Budgeting for Primary and Secondary Education.* New York: Praeger, 1972.

[17] J. Alan Thomas. *The Productive School.* New York: John Wiley, 1971 (paraphrase).

PPB in education is a specific operational dimension of the microeconomics of education, or an operational dimension of a study of production functions intended to influence policy formulation. An examination of input-activity-output relationships requires the same kind of information as does PPB. The major difference, and it should be a significant one, is that a study of production functions in education is typically "academic"—far removed from the operational world of school budgets. PPB, however, should be close to that operational world.

An examination of the budget manuals for three of the most advanced of the educational PPB systems, while not as searching as a multiweek, on-the-scene observation would be, nevertheless provides some insights. For present purposes, three PPB budget manuals were examined in detail—those of Dade County, Florida, of Montgomery County, Maryland (an ASBO pilot district), and of Hillsborough California City School District (San Mateo County), one of the pilot projects in that state. The striking characteristic about all of these PPB systems is their unbelievable complexity, the attention to the minutiae of budgetary classification, and their costliness—in terms of manhours, paid and unpaid—staff time, teacher time, community time.

Dade County, for example, which has been a centralized county school district for many years, identifies 194 programs and 300 responsibility centers (sites where educational activities are conducted). Each responsibility center may conduct several dozen programs, and each one is costed out for operations and capital outlay, and disaggregated into subprograms and program elements. The accounting support is centralized and computerized. There appears to be very careful attention to costs and very little attention to the relationship of costs to measurable outputs.

The Montgomery County effort cost about $50,000 a year for the years 1968-1970. It has involved (to a greater degree than Dade County) the administrative and teaching staff of the district. It has been extended to surveys of goals, with community participation, the mechanization of records, staff orientation sessions, summer workshops, the development of performance measurements, and an effort to relate inputs to specific programs. The program structure for Montgomery County defines three general program areas, thirteen program categories, and fifty-six specific programs apart from conventional classroom instruction. Within each program there are from two to ten program elements, which yield more than 200 program elements apart from regular instruction.

The Hillsborough effort is perhaps the most interesting. In 1968 it determined that its first task was to define the goals of the school district. This required the organization of school trustees, administrators, teachers, parents, and some students into a large number of committees. These committees met over a period of two years and emerged with specific goal statements. The committee for the primary mathematics program, for example, specified fifty-eight goals to be attained by the completion of the second grade. "By the end of the second year 90 percent of all students will be able to: [Goal No. 1] . . . differentiate between, identify the meanings of, and correctly use the mathematical symbols and processes presented in the state text (e.g., +, -, x, . > , <). . . . [Goal No. 50] . . . analyze and solve story problems as presented in the GCMP Math program with 80 percent accuracy."

The primary social studies program for the end of the second year specifies seven goals for civics and history, including the memorization of the pledge to the flag, two goals for government, three for citizenship, and four for economics, including, "By the end of the second grade, all second-grade students will be able to list the way foods are processed (packaged, stored, distributed, and marketed) on a written examination and in related classroom activities." In addition, there are four goals for geography and five goals for map skills.

Expenditure tabulations have been developed for each program to yield costs per student, including the allocation of overheads. Program expenditures have also been developed for all special identifiable activities, such as special education, music, guidance, and maintenance. Hillsborough has a $2,000,000 annual budget but does not have a computerized accounting system. Surely, this is systems analysis run riot, and it will inevitably bog down in its own weight. Fortunately, California's new program accounting manual stops far short of that level of detail.

The academics have also been infected by the virus of overrefinement. The Hirsch et al. volume proposes that school districts utilize highly sophisticated benefit-cost trade-off analysis in approaching their PPB problems. Thomas tries to simplify the process in *The Productive School,* but, in fact, the linear programming techniques that he suggests are far beyond the capability of any but the most sophisticated of school district budget officers.

Program budgeting in education need not degenerate into such an intricate and complex operation. PPB must, of course, have adequate accounting support at the very outset. But there is no reason why PPB must be districtwide in its beginnings, or why there must be community-teacher-administrator-student committees on goal-setting. PPB's one strength is the possibility of gradual introduction, starting with activities that can be costed and with outputs that can be measured—maintenance and food service, for example. Then it can be gradually extended to instructional programs, school by school, not necessarily districtwide. PPB is very difficult and an all out attack is likely to discourage all participants.

A more modest approach, and surely one likely to be more successful, is suggested by Bayla F. White of the Urban Institute.[18] Here the emphasis is on comparisons among schools within a single large district, with minimum requirements for data on inputs, socioeconomic variables, and outputs, but in a format that could be developed by the central school district staff without extraordinary effort. At the same time, starting with minimum data requirements permits expansion of the information base and the development of more sophisticated analytic techniques over time as experience dictates. But even a school rating system will encounter the opposition of teachers and principals who resist school-by-school comparisons.

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[18] *Design for a School Rating or Classification System:* Washington, D.C.: The Urban Institute, 1970.

The most modest approach possible to PPB in education is for a school district to retain on its central staff one or two economists or graduates of schools of education who are skilled in quantitative analysis. This core of "analytic capability" should then work jointly, at the outset, with the superintendent and the district business manager, addressing themselves to program issues that are susceptible to analysis.

The problems with PPB in education, as with all budgetary procedures in any government, is that "somebody" must decide whose interests are to be served by the technique—a principal who would like more budgetary flexibility; an accountant who would like to "control"; a superintendent who would like to "manage"; or perhaps students and teachers who would like to cooperate in a learning process?

The Affective Domain In the 1960s, with the widespread recognition of the failures in contemporary elementary and secondary education, the nation proceeded to undertake programs of compensatory education, particularly for inner-city students. This was a wholesome response reflecting some of the more positive aspects of the American body politic. The manifestation of this response was not only Title I of the Elementary and Secondary Education Act, but efforts undertaken by many city school districts first to equalize resource inputs at all ethnic and income strata and then to concentrate additional resources above and beyond equal resources into schools in culturally deprived areas. Schools of education also responded with urban teacher training programs and with increased attention to remedial teaching techniques.

Unfortunately, compensatory education is now judged by the majority of observers to be a failure. What seems to have happened, quite simply, is that most compensatory programs assumed that if a student could not learn his reading lesson in one hour a day then he had to be subjected to not learning it for another hour. There is great danger that compensatory programs reinforce a sense of failure.

The inadequacy of traditional compensatory education has provided encouragement to the proponents of free school and open classroom approaches. Many of the free school innovations place great emphasis on the development of a learning atmosphere and not on remedial techniques as such.

The affective domain, as noted above, refers both to the socializing aspects of the educational process and to the development of personal characteristics. It extends to the acquisition of social skills in the sense of working cooperatively with others, to the development of a sense of responsibility, self-confidence, and self-esteem. All of these are part of the process of education, in school and out of school.

Some, but certainly not all, economists who have worked on the microeconomics of education now feel that continued research in the cognitive domain is largely fruitless unless it is somehow combined with research in the affective domain outcomes. This is the responsibility of psychologists, sociologists, and educators, not of economists. Available evidence would suggest that much remains to be done in this area.

The second research task is to trace the links between the affective domain and the cognitive domain. What are the organizational, pedagogical, and authoritative patterns that encourage students to be interested in their schooling? If they are interested, are they then cooperative without being subservient? If they are cooperative, do they learn more? What is the relationship between in-school and out-of-school influences? Where and how does learning take place? What kinds of reinforcement patterns can be developed such that increased attention to the affective domain results in increased cognitive skills? What are the affective skills that contribute to future vocational success or encourage further education? As usual, it is easier to ask the questions than to answer them, or, in this case, it is easier to ask questions than to suggest a research design that would hold some reasonable promise of answering the questions.

An increasing number of economists who have worked in the microeconomics of education have recently become interested in working in the noncognitive domain.[19] Other economists feel that future microeconomic research should move in this direction, although there seems to be no consensus as to the specific structure or "laboratory" for such research.

The difficulties of this kind of research are substantial. The first is a lack of communication among economists, educators, psychologists, and sociologists. The long experience with interdisciplinary research in universities since World War II suggests that participants must be willing to devote a great deal of time to learning each others' language. Economists and educators have had some experience in working together in the past decade, but psychologists and educators have not always worked in harmony, and there are very few instances of joint research efforts undertaken by economists and psychologists, or economists and sociologists.

The second difficulty is the choice of the "laboratory." The private free schools would be relatively easy to work with, and many would be hospitable, but they are almost totally unrepresentative of the established order of public elementary and secondary education. Thus since we are not about to deschool society, it would appear necessary to work with selected public schools in a specific metropolitan area, or, if this were to be a large-scale project, with selected schools in several metropolitan areas. Minimum sample size would appear to require three types of schools—low-income black or Puerto Rican, middle-income white ethnic, and middle-upper-income suburban. Whether these should be elementary or high schools is not obvious. The "laboratory" must also be large enough to encompass significant variations in educational resource allocations and in administrative and teaching styles.

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[19] These include Selma Mushkin, Georgetown University, and Samuel Bowles and Herbert Gintis, University of Massachusetts.

The third difficulty concerns the enlisting of cooperation of school principals, accountants, teachers, and other staff members. The economist needs accurate data on the cost of inputs, on allocations of student time and teacher time, on the socioeconomic characteristics of students, and on teacher characteristics. School records do not now yield this kind of information. The support of teachers must also be secured. In some schools this is a matter of overcoming traditional inertia, but in other schools that have attempted substantial innovation, teachers are already greatly overworked. Many school systems expect teachers not only to keep abreast of professional developments in their fields, but also to retrain by way of after-hours courses in sex education, drug abuse, race relations, and computer-assisted instruction. Will teachers and administrators be receptive to a further critical analysis and evaluation by outsiders of what they are doing?

The fourth difficulty is the conceptual heart of the matter—devising and applying new measures of cognitive and noncognitive skills, tracing their interrelationships, and relating these outputs to resource inputs and combinations thereof. If this were easy, it would have been done long ago. Finally, the combination of cognitive and noncognitive research, even if all of the foregoing obstacles are overcome, will not have immediate payoffs. A decade, or at best half a decade, will be necessary before a body of systematic findings emerge.

If the foregoing is reasonably descriptive of the "costs" of this research, what then are the benefits? It must be admitted that the possible benefits are very uncertain. The mounting evidence that much of traditional education is a disaster, particularly in the inner city, and the powerful indictment by the recent critics of the oppressive and authoritarian educational structures that persist suggest that there is a continuing crisis. The success stories of dedicated teachers are cheering, but there are not enough dedicated teachers to go around.

The view that is taken here is that the heart of the matter is in teacher-student relationships and to a much lesser degree in school-community relationships. It may be hoped, but it can only be a hope, that research in the noncognitive and cognitive areas can contribute to better understanding and better practice in attaining a learning atmosphere in elementary and secondary schools. It can also be hoped that economists can thus contribute to an understanding of the kinds of school expenditures that are marginally effective in producing such an atmosphere. The benefits of this kind of research may exceed the costs.

Source: J. Burkhead, 'Economics against education', *Teachers College Record*, vol. 75, no. 2, 1973, pp. 193–205.

2

Educational production theory and teacher inputs

H. M. Levin

INTRODUCTION

The past decade or so has witnessed a proliferation of studies on educational production. Broadly speaking, these endeavors have sought to determine the relations between educational inputs and educational outcomes. The inputs that have been considered include the attributes of students as well as the amounts and characteristics of teachers, administrators, other personnel, facilities, and materials; the outcome measures have focused primarily on cognitive achievement.[1]

Both practical and intellectual concerns have stimulated these investigations. From the practical perspective, the costs of education have risen at a very rapid rate, and it has become more and more difficult for the states and their local educational agencies to provide the necessary revenues.[2] Further, the recent court challenges to the present methods of financing education have also stressed the need to understand how new methods of educational finance might more nearly equalize both schooling inputs and outcomes (Pincus, 1974b). Finally, the relative lack of effectiveness of compensatory educational expenditures to more nearly equalize the educational attainments of economically disadvantaged pupils with those of other students has tended to emphasize the high priority that must be assigned to ascertaining how educational resources might be used more effectively (Carnoy, 1972).

The study of educational production relations has also appealed to a broad set of intellectual interests. Traditionally, only educational psychologists studied the various aspects of teacher and school effects on students. However, more recently, sociologists, economists, and anthropologists have also begun to explore these subjects, and the current literature on school effects reflects the efforts of several of the social sciences.[3]

The concept of an educational production function is associated primarily with the application to schools of the theory of production from economics. The education industry is considered to be composed of a number of firms or schools that are engaged in converting educational inputs into educational outputs. Accordingly, most work on educational production functions attempts to estimate a statistical equation that is similar to

$$Y = a + b_1X_1 + b_2X_2 + \ldots + b_nX_n + e.$$

In this linear equation, Y is the educational output, and the Xs represent the various inputs such as the characteristics and numbers of teachers and other personnel as well as instructional materials and facilities. The bs signify the regression or slope coefficients for each input, showing the estimated effect of a unit increase of each input on output. The intercept term or constant, a, refers to that level of educational output that is not dependent on the inputs, and the residual or variance in Y that is unexplained by the equation is symbolized by e.

This type of equation has been estimated for school districts, schools, classrooms, and individual students (Burstein [1979] refers to studies and conceptual issues at different levels of aggregation). The typical measure of educational output has been a standardized reading or mathematics test, although some studies have utilized student attitudes or test scores that reflect other cognitive domains.[4] Student-related inputs include measures of pupil socio-economic status, race, and sex. School inputs have included such measures as class size, teacher experience, education, and verbal score, library facilities, and other indicators of educational resources (see the summaries in Brown and Saks, 1979; and in Averch et al., 1974). In a few cases the student and school inputs have been analyzed for their interactive effects on educational outcomes—for example, the possibility that smaller classes might have different impacts on children drawn from different socioeconomic origins (Summers and Wolfe, 1977; Tuckman, 1971).

But in spite of the relatively rapid development of this type of research, it is probably fair to conclude that the investigations have been more successful in demonstrating the inherent complexities of the phenomenon than in producing useful results. A number of surveys of educational production studies suggest little commonality among their conclusions (Averch et al., 1974). Further, few studies have provided results which would suggest that feasible policy differences in the magnitudes and types of educational resources would change appreciably the existing patterns of educational outcomes (Levin, 1977). Perhaps the only consensus one can find is that differences in student backgrounds are highly related to differences in student achievement and that the effects of specific school resources on student achievement will vary according to the social class and race of pupils (see Averch et al. [1974], as well as the works cited in n.1).

Many reasons have been given for the inconsistency of the findings and for their lack of relevance for educational policy. Among them have been the difficulties of measurement of both inputs and outputs (multicollinearity) that often prevent separating their unique effects on educational outcomes, incorrect specifications of the inputs and outputs of the schooling process and their functional relations, and a variety of other problems that run the gamut of econometric challenges in estimation (Levin, 1976a; Lau, 1979; Hanushek, 1979).

In this chapter I will suggest that a major deficiency in the research on educational production functions is far more basic. This shortcoming arises from the fact that empirical studies of the educational production function are based on the attempt to link statistically a list of inputs with a particular output, without the assistance of any underlying theory. While this problem has been mentioned in the analytical surveys of educational production functions, its implications have not been appreciated fully. Typically, educational production functions are constructed by specifying lists of educational inputs chosen on the basis of their prominence in the educational budget, their correlations with student achievement in previous studies, the ready availability of data, speculations on what might be important, and other ad hoc criteria. While many studies have been careful and imaginative in their specification, measurement, and estimation, the lack of a guiding theoretical framework has created the inevitable result that they have failed to move beyond a relatively crude empiricism. It is also likely that this handicap has been primarily responsible for the failure of the body of educational production research to contribute to a cumulative pattern of knowledge with reasonable consistency and predictive power.

Normally, when a situation of conceptual and theoretical ambiguity persists for so long in an active field of research, there is a compelling reason for that situation. That is, the lack of theoretical development is not likely to be an oversight on the part of researchers. Rather, it is likely to derive from the underlying complexity of the phenomena that are being explored or from other obstacles that prevent the type of simplification and reductionism necessary for the systematic construction of a conceptual framework. Certainly, an understanding of how students and educational institutions function to augment the learning process is an area that is fraught with complexities. Indeed, there are at least two types of theoretical requirements that must be developed and joined if we are to have an appropriate conceptual base for improving the estimation of educational production functions.

First, it is necessary to delineate a theory of schooling that will enable the specification of the relation of inputs to outputs. Second, it is necessary to construct a theory of organizational behavior for schools that will address the principles on which schools are organized for learning and on which resource decisions are made.[5] The first requirement attempts to address how differences in educational inputs and their organization create differences in educational outputs. The second seeks to ascertain how and why schools select, utilize, and organize inputs in the ways they do. The principal purpose of this chapter will be to begin to address these two questions in the hope that some progress can be made along the arduous path of developing the appropriate theoretical frameworks. Two conceptual strands will be introduced, and an attempt will be made to integrate them in the context of educational production. They will then be applied to the particular problem of attempting to specify teacher inputs for the educational production function. Both research and policy implications of the approach will be explored.

In the next section I will present the theory of schooling that will be employed, and in the following section I will propose an organizational approach that seems to have some useful properties. Next I will suggest the implications of these two theoretical insights for the estimation of educational production functions and, in particular, for the specification of teacher characteristics. Finally, I will set out some of the consequences of this presentation.

THEORIES OF SCHOOLING AND EDUCATIONAL PRODUCTION

Before proposing a specific theory of schooling that might be useful for studying educational production, it is important to specify what is meant by a theory in the production context. This is particularly important because there exist at least two major theoretical approaches to learning in psychology—those associated with behavioral psychology and those with developmental psychology (a presentation of these and other approaches to learning is found in Hilgard and Bower, 1975). Both represent broad paradigms for ordering and understanding the process of learning. However, an educational production function does not need a basic understanding of the learning process as much as it requires an understanding of the "technology" of that process. For example, studies of agricultural production do not specifically address the fields of plant biology or physiology. They do not necessitate an intricate knowledge of photosynthesis or of the biochemical processes by which nutrients are converted into plant growth. All that is required is an overall understanding of which nutrients and conditions must be present to stimulate growth. No explication of basic science is required for such an understanding, but the underlying scientific knowledge must be translated into a technical or engineering relationship (for a more complete discussion of these issues, see Salter, 1960).

Given this criterion, a most appropriate candidate for a useful learning theory in the educational production context is the model of school learning that has been proposed by John Carroll (1963) and further developed by Bloom (1976) and Block (1971, 1974). This particular approach has the desirable properties of simplicity, elegance, and utility. Consistent with the previous discussion, Carroll has noted:

> This model of school learning should not be confused with what is ordinarily called "learning theory," that is with the exact scientific analysis of the essential conditions of learning and the development of systematic theory about this process. Rather the model may be thought of as a description of the "economics" of the school learning process; it takes the fact of learning for granted. (1963:725)

Carroll's model has five components, three relating to the individual learner and two pertaining to the learning conditions. Individual factors include (1) student aptitude, which is defined as "the amount of time needed to learn the task under optimal instructional conditions" (1963:729); (2) student ability to understand instruction; and (3) student perseverance, which is "the amount of time the learner is willing to engage actively in learning" (729). Factors external to the student are (4) time allowed for learning and (5) quality of instruction, which is viewed as a measure of the degree to which instruction enables a student to master a task in the shortest time consonant with his or her aptitude. Carroll then relates these variables to the degree of learning of a student, which is determined by the time actually spent relative to the time needed.

In this exposition I wish to disregard individual learner characteristics and address the two external or school factors that can be used to construct the input requirements for educational production. More specifically, I wish to focus only on the specification of the teacher inputs. The reason for this restriction is to develop the conceptual framework within an initially tractable, but significant, part of the schooling process. If this initial foray seems useful, it will be possible to extend the analysis to student characteristics and behavior and to other school inputs.

Using the Carroll formulation, we can address the question, for a given group of students, which characteristics of teachers and instructional activities will determine learning outcomes? Carroll has identified the quality of instruction and the time that students are exposed to instruction as the crucial variables determining the amount that will be learned. Accordingly, we might address the specification of teacher inputs into the educational process by exploring the determinants of the quality of instruction and the allocation of teacher time to particular instructional tasks.

Capacity, Effort, and Time

There are three components of teaching input that, when taken together, determine the quality of instruction and the allocation of instructional time. These three components are the capacity, effort, and time allocation of the teacher, referred to by the acronym CET. Each dimension will be described, and the CET paradigm will be compared with the tacit assumptions underlying the usual specification of teacher inputs in educational production functions.

Capacity refers to the personal attributes of the teacher that can be used to provide instruction and to assist learners on any particular instructional task. Just as a student has an aptitude to learn in any specific area, a teacher has an aptitude to teach. Capacity to teach is determined by such factors as basic abilities, knowledge, creativity, and other personality traits, and it may be affected by the teacher's education, training, and experience. Precisely what capacities are necessary or beneficial for increasing the quality of instruction will obviously depend on the instructional task. That is, we are not assuming that there is a generalizable capacity for teaching that is equally applicable to all tasks. Just as the capacity to provide instructional services in mathematics may require very different skills than those needed for teaching literature, such narrower tasks as instruction in arithmetic operations may require considerably different capacities than does instruction in civics or creative writing. The important point is that capacity for instruction has meaning only when it is referenced to a particular instructional task. The difficulty of ascertaining what are the relevant capacities and for what instructional tasks besets the research literature on teaching effectiveness (Gage, 1978).

The quality of instruction depends not only on the capacity of the teacher, but also on the *effort* of the teacher to draw upon that capacity to provide instructional services. That is, capacity represents a set of traits possessed by the teacher that can be utilized in the instructional setting. The provision of instructional services requires that capacity be converted into teaching activity, a process that requires effort on the part of the teacher. Effort can be thought of as the level of energy used to convert capacity into instruction for each unit of instructional time. The greater the teaching effort, capacity being constant, the greater the quality of instructional services.[6] In this respect, teachers of great capacity who muster little effort may show poorer results than those with a lesser capacity and greater effort.

The final component of the CET complex is the amount of *time* devoted to a particular instructional task. This is obviously a crucial determinant in the Carroll model of how much will be learned, and it is sensible to assume that the amount of instruction provided by a teacher in any particular instructional area will have an effect on learning outcomes.[7] This relation is so straightforward that it needs little comment. It is also the strongest finding in one of the most extensive studies on teacher efforts: "Time allocated to instruction in a content area is positively associated with learning in that content area" (Fisher et al., 1978:11-17).

Integrating these three components into Carroll's conception of the external conditions that affect learning, we see a rather natural interface. Teacher capacity and effort taken together represent the determinants of the quality of instruction, while teacher time devoted to each instructional task signifies the opportunity to learn. It is these three basic dimensions of the teacher and the teaching activity that present a conceptual framework for specifying teacher input into the educational process.

It is useful to contrast these conceptual insights with the tacit underpinnings of the standard educational production function. The typical educational production function focuses only on those teacher variables that might represent proxies for the capacity dimension—measures of teacher experience, education, verbal score, attitudes, and other traits. They do not address themselves to either the effort or the time allocation that are necessary to transform capacity into instruction. Either the effort and time components are omitted because they are considered to be unimportant, or there is the tacit assumption that these factors are also reflected by the statistical indicators for teacher capacity. It is assumed that teachers with identical measures of capacity will provide identical measures of effort and time allocations with respect to each instructional area. Alternatively, it might be assumed that specifying teacher characteristics as inputs should preclude concern with teaching processes. But I have argued that the actual teaching input will depend on the complete CET complex rather than on teacher capacity alone.

Whatever the interpretation of the traditional specification of teacher inputs into production functions, the CET approach suggests that it is seriously flawed. But this assertion raises the difficult challenge of determining how schools are actually organized to manipulate each of the three components of the CET composite. That is, if differences in each of the dimensions of CET create differences in teacher performance and student learning, then a theory of school organization would need to take account of how schools select and train teachers with the appropriate capacities, motivate them to provide the level of effort necessary to convert those capacities into a high quality of instruction, and induce them to allocate their time appropriately to the different instructional foci. In the next section I will attempt to explore the nature of this problem and its solution.

SCHOOL ORGANIZATION AND TEACHER PERFORMANCE

The issues raised by the CET approach can best be appreciated if we refer to a situation in which they are resolved with minimal institutional intervention. I will call this the autonomous professional paradigm.[8]

The Autonomous Professional Paradigm

Using a definition of professionalism that assumes almost complete autonomy on the part of teachers, the only requirement on the part of the school would be the selection and hiring of teachers to provide instruction in particular subjects. Once the teachers were hired, they would be given a group of students and a classroom or other facilities as well as a set of instructional priorities or subject areas that were considered important. In this way, teachers would be given a great deal of autonomy in recognition of their professional status and expertise (Bledstein, 1976: 87-88).

More specifically, teachers would be free to decide how to utilize their time, organize the instructional process, select instructional materials, assess and certify student progress, and so on. Presumably, the schools would hire teachers on the basis of their capacities. The actual organization and implementation of the instructional process would be carried out according to the professional judgments of the teacher. That is, teachers would have the autonomy and independence to allocate their time and effort in the manner that they saw fit. Organizational requirements from the perspective of the school would be minimal.

Obviously, teacher selection and budgetary allocation would be important, but school control over such matters as curriculum specification, administrative supervision, time allocation to specific subjects, selection of instructional materials, teaching methods, grading methods, and other organizational practices would be obviated by the autonomous professional model. Individual teachers would use their own professional training, experience, and judgments to make decisions on these matters, and teachers would largely control both the instructional process and the nature and outcome of their own work activity.

But while teachers are often referred to as professionals, it is hardly this definition of autonomous professionalism that is intended. Teachers are not autonomous craftsmen who are allocating their time and efforts according to their preferences and professional judgments. Instead, they are employed according to a wage contract by a complex, bureaucratic organization that defines to a large extent the nature of their work activity. The model of the school is not that of a professional anarchy, but of a highly organized bureaucracy in which the schooling process is set out in a clearly articulated fashion. Time allocations to particular subjects tend to be set according to institutional rules; instructional materials are selected according to centralized mandates; variations in teaching methods are circumscribed by mandatory confinement of students to orderly classrooms, supervisory evaluations, and organizational sanctions with respect to "unauthorized" subjects; and so on. On balance, standard operating procedures are far more important than professional judgments in describing the activities of teachers.[9]

Educational Professionals and Bureaucracy

Why does the bureaucratic model dominate the schools instead of the autonomous professional paradigm? According to the historical and analytical literature, there are many answers to this question. Some historians have argued that many leading educators, school administrators, and boards of governors were so heavily imbued with those principles of business organization that were sweeping America to the forefront of world production and commerce that they believed that these concepts would also create "efficient" schools.[10] In a more analytic mode, radical economists and revisionists historians have seen the centralization and bureaucratic control and organization of schools as a response to the forces of industrial capitalism and its need for the reproduction of appropriately socialized labor for the emerging corporate capitalism of the later nineteenth century.[11] They point out that changes in the organization of schools tended to correspond with similar changes taking place in business organization. Centralization of the educational bureaucracy, tracking according to ability, testing students for school allocation, and vocational specialization were all associated with prior changes in the organization of production that required new educational departures. Thus, these organizational features of the schools can only be understood by reviewing the needs of corporate capitalism for wage labor with the appropriate skills, attitudes, and individual values that would enable its domination and exploitation by the capitalist class.[12]

What is common to these explanations is that schools have an institutional agenda that is not left to chance. Rather, schools are organized to produce certain predictable learning outcomes, both cognitive and affective. In order to obtain these outcomes, schools have disdained the autonomous professional model and adopted a mode of bureaucratic organization with top-down control of the instructional process. Although there is no difficulty in obtaining instructional effort and time allocations from teachers when these conform with their own preferences and choices under the autonomous professional paradigm, there is great difficulty in obtaining their efforts and time when centralized control of the instructional process, relative uniformity of teaching activities, and predictability of results necessitate a different agenda. On these matters, the intrinsic needs of teachers and those reflected by the governing authorities and structures of schools might not be fully compatible. Thus, schools were faced historically with creating a mode of organization that would standardize the instructional process and teaching activities by taking control of them away from the vagaries of individual professional judgments.

Before reviewing how this was done, it is important to point out the parallel between this situation and the transformation of the labor process under industrial capitalism (see Marx, 1964a: pts. III and IV; and Braverman, 1974). While the autonomous professional paradigm refers to teachers as independent persons who control the process and product of their activities, the actual school setting utilizes teachers in ways that minimize their control over the instructional process. A similar loss of control by workers of the work process was an integral feature of the history of capitalism (Marx, 1964b; Ollman, 1971). Marx saw this as a necessary requirement of industrial capitalism, in which the needs of capital accumulation would create production activities that would alienate workers from each other as well as from the process and result of their work activities (Marx, 1964b). That is, the autonomy of workers would be subjugated to the needs of the owners of capital. This was accomplished through the establishment of a pyramidal hierarchy of control, in which most jobs would be transformed by the adoption of a minute division of labor into highly routinized and simple tasks that would be repeated endlessly (Braverman, 1974). Such an organization would minimize the skill requirements of work; simplify supervision of workers; increase discipline, as workers could be easily replaced in these unskilled and repetitious tasks; and divide the working class against itself as individual workers competed with each other for stable employment or promotion (Haber, 1964). In contrast with earlier forms of work and artisanship, work lost its intrinsic meaning, so that workers had to be motivated by a system of extrinsic rewards. That is, the boring and repetitious tasks could not create satisfaction in themselves, so workers became socialized to working for factors external to the work process such as the wages necessary for survival or for increased consumption.

Accordingly, Marx made a distinction between the hiring of labor power and the extraction of labor. The capitalist firm had to face two types of decisions. First, the firm had to hire workers for the lowest possible wage in order to acquire the labor power that was needed for production. But the hiring of labor power was not equivalent to obtaining labor. If jobs were not intrinsically satisfying, alienated workers would be loathe to put much effort into them. Thus the capitalist firm was faced with the second type of decision—how to create a form of organization of work that would extract a maximum of labor from labor power.

Under earlier conditions of slavery or possible starvation, the fear of losing employment was enough motivation for workers to put forth great effort. But as slavery and starvation became proscribed by society, the capitalist firm was pushed to adopt a method of organization that would extract labor in a standard and routinized manner. The evolving forms of organization of corporate capitalism are a response to the need to extract labor from alienated workers (Braverman, 1974; Noble, 1977; Marglin, 1974). Through a combination of bureaucratic and hierarchical work organization (based on the work of Max Weber), minute division of labor and wage incentives (based on the work of Frederick Taylor) at the level of the firm, and the disciplinary effect of a reserve army of unemployed on the work force and of recession on the level of the economy, monopoly capitalism was able to solve the problem of extraction of labor, a solution that has contributed historically to high rates of profit and capital accumulation.[13]

While schools are neither owned nor controlled directly by the capitalist class, they do face a similar organizational dilemma. As long as teachers are accorded professional status and autonomy, it is not difficult to extract labor from them. Their professional interests will generate those work efforts that will provide intrinsic satisfaction to them as professional teachers. But as the schools have been transformed historically along corporate and hierarchical lines, the teacher has lost much of this earlier autonomy. To an increasing degree, teaching has become highly routinized and controlled, in order to assure a continuous and uniform process that does not depend on individual preferences or differences among teachers. Indeed, a standard criterion discussed in curriculum construction is that of making the curriculum "teacher-proof."

As teacher preferences and judgments have become relatively inconsequential in terms of the organization of the instructional process, teachers have become alienated in the Marxian sense. That is, they have lost control over the process and product of their activity. This has meant that the schools must use a variety of devices to motivate or coerce teachers to devote effort and time to the overall organizational agenda, since many of these activities are not of intrinsic value to them. In this context it would hardly be surprising to find that the schools followed the corporate capitalist model for cementing control and created uniform teacher work roles and activities.[14]

The traditional educational production function utilizes only measures of teacher capacity in specifying teacher inputs. That is, it is assumed that capacity will be automatically transformed into the effort levels and time allocations that are consistent with the agenda of the school. On the contrary, success in converting the capacity of teachers (or labor power) into teacher effort and time allocation (or labor) will depend on how the school is organized to make this transformation. Teachers who are largely alienated from the instructional process in which they must participate must be manipulated by appropriate extrinsic rewards or forced by the structure of school organization and standard operating procedures to perform at the level of effort and in the manner that is consistent with the overall objectives of the institution. In the next section I will discuss some ways in which this is done and the consequences for educational production.

DETERMINANTS OF CET

I suggested above that a major deficiency of the present literature on education production functions is the lack of a conceptual framework underlying the work. Two specific needs were a theory of learning and an organizational framework that could explain the selection and utilization of teacher services. In response to the first requirement, I proposed the model of schooling that was developed by John Carroll (1963). On the basis of that model, I was able to suggest that there are three dimensions of the teaching function that contribute to learning: teacher capacity and effort represent the determinants of the quality of instruction, while teacher time devoted to each instructional task signifies the opportunity to learn.

But this poses a problem for the organization of teaching services and instruction if the instructional agenda differs substantially from the objectives and professional judgments of individual teachers. In some way the school organization is faced with providing a systematic program of instructional processes addressed to particular institutional objectives, but it must rely on individual teachers who are hired as professionals to provide the instruction. Under a professional autonomy model, teachers would be hired according to their capacity to teach and would be given control of the instructional process. From the institutional perspective, the consequences of professional autonomy are likely to differ from teacher to teacher. In order to provide greater uniformity of instruction and achievement of institutional goals, schools must utilize the three components of teacher capacity, effort, and time allocation to focus on the institutional mission.

This task of integrating teacher performance and institutional objectives is more difficult than it might seem at first glance. Even if all teachers who are hired have the capacity to carry out the standardized instructional processes and tasks expected of them, they might not agree with this version of teaching. To a large degree teachers view themselves as deserving some autonomy of judgment, and such tasks as keeping order and discipline or teaching certain subjects in the way that the school approves might not coincide with their values as professionals. These conflicts are clearly reflected in a summary of an extensive set of teacher interviews on the teaching role:

> Teachers seem to want conditions which favor more control over student involvement, more discretion to make decisions, and greater trust from principals and parents. Yet, one senses a reluctance to press the case to its logical extreme; it is as if these teachers half accept and half reject the limitation imposed by their status. Their status clearly does not grant them control over the conditions they believe are important and necessary; they are not permitted to arrange instruction in a driving, aggressive way. (Lortie, 1975:185-86)

Under such conditions, it is important to address the question of how educational institutions and the larger society that sponsors them are able to extract the appropriate amounts and types of work behaviors that provide a reasonably uniform and predictable set of learning outcomes for students. That is, we must focus on the manner in which schools are able to obtain teachers with the appropriate capacities for carrying out these tasks and to motivate them or to require them to put in the effort and time necessary to implement the tasks in a manner consistent with the instructional agenda of the institution. The success of the school organization in achieving these goals will determine the effectiveness of the teaching inputs into the educational production function. Accordingly, it is useful to review each component of CET and the methods that the school uses to manipulate them to achieve its objectives.

Capacity

Capacity was defined as that set of personal attributes the teacher brings to the instructional process that can be used to carry out the instructional task.[15] It is a measure of capability. Obviously, it must be judged with respect to the specific tasks that are thought to be a part of the instructional process. Such factors as competence in subject matter, ability to explain, speaking proficiency, imagination, and related traits might be used to assess capacity. Teacher selection would be based on these factors or on certain indicators that are thought to determine them, and in-service training and the socialization effects of experience might develop them further (teacher socialization is stressed in Lortie [1975: ch. 5]). What are the specific indicators of capacity? The most important ones are probably the individual's innate abilities and personality traits, educational characteristics with respect to the type and quality of training, and socialization such as work experience. Capacity might be measured by credentials, standardized tests, or interviews, or a combination of all of these.

As mentioned previously, teacher capacity variables represent the only measures of teacher characteristics that are normally included in educational production functions. It is presumed that the effort of the teacher and the time allocation pattern is either irrelevant or is reflected in the capacity measures. However, I have suggested that this tacit presumption is likely to be erroneous. This omission may represent the most salient reason that teacher capacity variables do not seem to have a powerful statistical effect on student achievement. That is, teacher efforts and time allocations to particular types of student achievement may vary in such a way that capacity is not transformed into a high level of instructional service.

Effort

Effort was defined as the level of energy used to convert capacity into instruction for each unit of instructional time.[16] A teacher with high capacity but no interest in the instructional task may provide only a lackluster effort, while one with lower capacity and greater interest could provide a higher level of effort. Clearly a high level of effort can compensate for low capacity and vice versa. There are at least two aspects of effort that require emphasis. First, the level of effort is likely to be related to the particular instructional task or process which the teacher is expected to address. Those tasks or processes that are consistent with the teacher's own values and sense of what is good teaching will likely induce higher levels of effort than those that are external to or that contradict the personal agenda of the teacher. This tenet suggests that, like capacity, effort must always be viewed in the context of a particular task or educational goal rather than as a general construct.

If we are concerned in our evaluations with the inculcation of certain attitudes in students or with a particular type of scholastic achievement, both capacity and effort must be assessed with respect to those particular outcomes.

Second, it is difficult to measure effort directly. While it is possible to assess the degree of teacher energy or enthusiasm or conscientiousness in some proximate way, there are probably no methods of judging effort outside of a direct assessment of teacher behavior in a particular instructional setting and situation (Gage, 1978). This means that a specification of effort in a school learning model probably must use approximate and indirect measurements or surrogates. Since it is difficult to measure effort directly, it is important to speculate on the functional determinants of the effort variable. This analysis will also throw light on school policies that are designed to obtain teaching services (labor) from teaching capacity (labor power) by attempting to maximize the level of effort put forth by the teacher.

There are at least four fairly distinct sets of determinants of teacher effort: (1) teacher preferences, (2) organizational incentives, (3) organizational climate, and (4) teacher training and retraining. Teacher preferences refer to those instructional situations which correspond with the professional judgments and personal views of the teacher in such a way that the teacher receives intrinsic satisfaction from the activities. To the degree that teachers are selected and assigned according to the consonance of their instructional tasks with their preferences, teacher motivation and resulting productivity are likely to be higher than when there is a poor match between preferences and teacher requirements. Thus, an overlap between the preferences of the teacher and the actual instructional situation with respect to subjects, types of students, characteristics of curriculum, and the nature of instructional materials is likely to contribute to greater teacher effort than a mismatch on these dimensions. Like other persons, teachers will devote more energy to those tasks that provide intrinsic satisfaction and that conform to their values and beliefs than to instructional tasks that are "forced" upon them.[17]

Teacher autonomy is closely related to the teacher preference determinant, and we would expect that the greater the degree of autonomy in controlling the instructional process, the greater the level of effort that would be devoted to that process. That is, when teachers are able to choose the methods by which they will accomplish tasks, they are likely to put more energy into their endeavors. Teacher autonomy can take many forms. For example, teachers as a group could participate in a democratic process that would set out goals and objectives as well as aspects of the instructional process such as time allocations, choice of instructional materials, and curriculum approaches.[18] In addition, greater tolerance or encouragement of individual teacher autonomy would work in the direction of greater motivation and enthusiasm for carrying out instruction.

The second category of organizational determinants of teacher effort is that of institutional incentives of an extrinsic nature. Every complex organization has both explicit and tacit rewards for appropriate work behavior. The most obvious of these are the structure of pay and opportunities for advancement. But in addition, the behavior required for retaining jobs, for obtaining better work or teaching assignments, and for attracting other scarce resources must also be considered. Probationary teachers must show a level of effort, motivation, and general behavior that conforms to institutional expectations for teacher performance. As mentioned previously, some teaching assignments are preferable to others. The allocation of these opportunities can be tied to the level of effort of a teacher in meeting instructional expectations of the institution.[19] Finally, such sanctions as accountability schemes based on observation of the teacher in the classroom setting or testing the students to ascertain teacher effectiveness can be used as institutional devices to get teachers to put appropriate levels of effort into their teaching.[20] In these cases the educational decisionmakers or administrators can manipulate teacher effort through a system of external rewards or sanctions.

The third category of policies and determinants of teacher effort include those that affect the organizational climate and working conditions. Any set of conditions that makes the teacher feel more a part of the decisionmaking apparatus or more appreciated or that provides better working conditions can contribute to the effort or productivity of the teacher (see Pencavel [1977a] for an analysis of the value of efforts at raising employee morale to increase work effort). Among these factors are such conditions as inspirational leadership, a feeling of teamwork and cooperation, an attractive physical environment, workable class size, and other factors that may contribute to teacher moral and esprit de corps.

Finally, teacher training and retraining might be used as a way of improving effort and productivity by altering the values and attitudes of teachers. For example, one strategy for attempting to improve the provision of instructional services for minority and educationally disadvantaged youngsters has been to provide in-service courses of training that would make teachers more familiar with the culture and the educational needs of such children. While these courses were designed to increase teacher capacity, they also were intended to create a greater willingness and desire to work with such students.

Time Allocation

While teacher capacity and effort determine the quality of instructional services in any particular area, the total amount of learning that will take place will also depend on the time devoted to the instructional task. Both common sense and research studies have emphasized the crucial role played by student exposure to instruction in explaining learning outcomes (Fisher et al., 1978). Under the professional autonomy model, teachers would decide how they would allocate their time to the different instructional activities that they chose. But school organizations attempt to make certain that there is at least a minimal allocation of time to each of the subjects and other activities that are considered to be important to the institution. Through organization of the curriculum into discrete areas and the day into discrete time periods, the school attempts to impose an allocative structure on the instructional process. Further, teachers are given other responsibilites such as taking attendance and various clerical chores that make particular time demands on their schedules. To a great extent—though not completely—the teaching day, week, and year are allocated to activities according to institutional design rather than according to the discretion of the teacher.

But even within this structure, different teachers may respond differently to time allocations. Some teachers may spend greater time on those subjects or activities that they feel are important while minimizing the time allocated to other activities. For example, at the elementary school level the transition from one subject to the next can be blurred. At the secondary level the teacher can emphasize some tasks, while minimizing others. External accountability devices such as evaluation of teaching by supervisors and testing programs can be used to get teachers to devote more time to those areas that are being evaluated or tested. But there are still likely to be substantial differences among teachers in terms of the "true" time that is allocated to any particular instructional task, even though the ostensible or official time allocations are largely standardized by school practice.

In summary, the determinants of CET can affect the quality and amount of instructional services in a number of ways. Through selection and retraining of teachers, the capacity to provide instruction is determined. It is possible to affect the level of teacher effort or productivity in devoting energies in the institutional agenda through motivating teachers by matching them to experiences that they prefer; allocating extrinsic rewards such as pay, status, mobility, and job tenure according to institutional criteria; creating a supportive organizational climate; and providing additional training. Finally, the allocation of teacher time to activities is affected by curriculum structure and institutional demands as well as by accountability approaches that emphasize measuring particular outcomes. Such accountability schemes would also have the effect of increasing teacher effort in the areas that are evaluated. What implications do these theoretical insights yield for the specification of teacher inputs into the educational production function?

CONSEQUENCES FOR SPECIFICATION OF TEACHER INPUTS

This conceptual excursion has at least two major consequences for the specification of teacher inputs into educational production. The first is that the inclusion of teacher characteristics or capacity variables, by themselves, is inadequate because they do not reveal the degree to which such characteristics are converted into educational services. The second is that the organizational forms and content of schooling will determine to a great extent the effort and time allocations of teachers. Thus, a full model of educational production must take account of both effort and time allocation variables and their organizational determinants. Let us deal with each of these consequences in turn.

As I have emphasized previously, traditional approaches to the educational production function have utilized only measures of capacity of teachers, while ignoring effort and time allocations. Why is it that only the capacity measures have been specified? The answer is surely grounded in the general approach to estimating industry production functions in which only the characteristics of labor are used as inputs. That is, the distinction between the hiring of labor power and the extraction of labor is not normally considered in estimating industry production functions. The lack of a distinction between these two concepts in the neoclassical production function derives from the view that they are not different. The firm is viewed as hiring labor services, even though the wage contract hires merely the time of the worker. It is assumed that there is a uniform and consistent transformation of labor time into labor services, depending on the available technology and organization of production. Firms are considered to be operating in a competitive environment and seeking to maximize profits. Under such conditions, it is assumed that the extraction of labor services can be derived routinely from the quantity and quality of labor inputs or "human capital."

To a certain degree this assumption might be valid for a profit-maximizing firm. Both control of the production organization and the incentive to maximize extraction of labor might ultimately contribute to a standardization and uniformity of the transformation process between capacity of labor and extraction of labor services. Indeed, the attempt to routinize the work process into a large number of simplified and repetitive tasks represents a principal method by which a relatively predictable amount of labor could be extracted from relatively low wage and less skilled workers (Braverman, 1974). Historically, this process replaced the unpredictability and autonomy of activity of the more costly artisan or craftsman in the production process. Thus, the firm was able to cement greater control over the work process and to reduce the cost of output.

But when schools attempt to construct similar types of organizational devices, it is not clear that they yield the same results. Schools are not profit-maximizing firms, but organizations that must respond to a wide variety of political pressures with respect to educational content and process while preparing students for the realities of capitalist work. They represent the major vehicle for social mobility and opportunity, while reproducing the unequal hierarchy of skills and behaviors that are required for production under monopoly capitalism. To a certain extent these roles are incompatible, since the former suggests greater equality while the latter suggests the maintenance of inequality.[21] Further, teachers cannot be supervised as readily as can most blue and white collar workers, and the output of the teaching process cannot be readily measured since it is psychological in nature and inextricably linked to the nature of the student input. Thus, no matter how much schools attempt to routinize and regularize the instructional process, the actual effects are probably very diverse because of the lower level of control and internal contradictions in their operation. This means that the actual effort and time allocations of teachers devoted to the instructional process for any set of instructional tasks are likely to differ considerably (see Levin [1978] and Levin and Carnoy et al. [forthcoming] for a discussion of internal contradictions in the schooling process).

If the foregoing is correct, the omission of effort and time allocation variables in the existing educational production function research is a serious one. In contrast, recent emphasis on "time in learning" in the classroom setting does address the time dimension. However, while the time aspect of CET is specified in those studies, the effort and capacity variables are not (see Harnischfeger and Wiley, 1979; Thomas, 1977). Even in a time allocation study for a single classroom, the allotment of time to particular students or to specific subjects is not a sufficient measure of learning opportunity. To the degree that differences in effort are related to different subjects or to particular students and to the degree that teaching capacity differs according to subject, the full range of CET variation must be explicitly taken into account. Thus, research on specifying and measuring teacher inputs into educational production must focus on all three components.

One apparent issue that is not addressed here is the potential role of teacher collective bargaining in altering the institutional conditions that affect the CET complex. It is probably safe to speculate that those aspects of organizational behavior of schools that have an impact on teacher recruitment and utilization are not likely to change through the collective bargaining mechanism alone. First, most of the conditions that determine the work situation are probably difficult to alter, as they derive from state and federal laws, as well as from deeply accepted beliefs about the nature of schooling, parental pressures and expectations, and so on. Further, some issues are considered to be nonnegotiable by both parties, as the extension of collective bargaining in the public sector has reflected the sanctimony of property stewardship and its prerogatives in the use of labor in the private sector. The result is that bargaining takes place only within a fairly well-defined framework of issues such as salaries, fringe benefits, class size, and preparation time. That is, the bargaining arrangement tends to treat the basic parameters of school organization as sacrosanct, while negotiating employee benefits within that framework. Certainly, this has been the traditional role of trade unions in other industries, and it represents a historical limitation of trade unionism in obtaining structural changes in the capital-labor or employer-employee relation (Gorz, 1968; Aronowitz, 1973; Hyman, 1973).

Further, teachers do not see such basic challenges as promising success, and they are deeply aware of the risks in raising these types of issues. Lortie summarizes these feelings and the dilemma that they entail:

> There is a certain ambivalence, then, in the teacher's sentiments. He yearns for more independence, greater resources, and just possibly, more control over key resources. But he accepts the hegemony of the school system on which he is economically and functionally dependent. He cannot ensure that the imperatives of teaching, as he defines them, will be honored, but he chafes when they are not. He is poised between the impulse to control his work life and the necessity to accept its vagaries; perhaps he holds back partly because he is at heart uncertain that he can produce predictable results. (1975:186)

On the basis of his interviews, Lortie concludes that teachers accept the terms of control over students, space, supplies, and schedules that is set out for them by the organization: "For at the base of teacher status is the indisputable constaint that without access to a position in the schools the teacher cannot practice his craft" (185). Given the present situation of teacher oversupply (Freeman 1976; ch. 4) and falling enrollments because of changes in demography, it appears that this sanction has become even more dominant, despite the increase in collective bargaining.

There are a number of research challenges emanating from this analysis. First, if effort is such a key variable, its inclusion in the teacher specification of the production function is crucial. Yet there is no evidence that a useful metric for assessing effort is available. Further, it is not clear how one can even develop an approach to measuring what appears to be unmeasurable. This means that it may be necessary to assess effort indirectly by using various proxies or determinants of effort such as attitudes toward particular instructional tasks. Or alternatively, it may mean that the pursuit of the educational production function is a lost cause.

A second potential difficulty is separating those factors that are endogenous to the overall production model from those that are exogenous. That is, if the structure of educational institutions is determined by factors largely beyond the control of the educational manager, it will not be possible to think in terms of manipulating the various factors that determine the CET complex. Much of the historical analysis suggests that the particular organizational features of the schools reflect forces that emanated from the development of work organizations under a system of monopoly capitalism and state bureaucracy. From a different perspective, John Meyer (chapter 1 in this volume) has argued that educational institutions are embedded in a larger organizational framework that is often overlooked and may dominate institutional behavior. Certainly, a plethora of external influences tends to limit the options of educational administrators. The impact of state education codes just by themselves represents formidable constraints on managerial prerogatives with respect to curricular content, teacher licensing, selection of instructional materials, conditions of work, school facilities, and other matters. When one adds to these the values and beliefs held by teachers, students, parents, administrators, and the general public that also support the status quo, it is difficult to argue that the determinants of CET are endogenous to a particular school setting.

However, it is worth investigating the degree to which individual schools or school systems have discretion over the CET dimensions. To what degree do school administrators exercise managerial control over the selection of particular teacher capacities, and to what degree are they able to use various organizational devices for encouraging or discouraging the levels of effort and time allocations with respect to different instructional processes and tasks? Alternatively, to what degree do these practices reflect a social equilibrium among the political demands and social values created by other social, economic, and political institutions that are essentially external to the school?

This chapter has attempted to depart from the usual framework that is assumed in generating the statistical estimation of educational production functions. It has carried out this task by broaching a conceptual framework for understanding how teacher inputs are used in educational production to affect student learning. To some researchers it may provide a basis for improving the estimation of educational production functions, while to others it will document the futility of going further in that direction. At the very least, I hope that it provides an impetus for further discussion and refinement of the organizational functioning of schools.

NOTES

1. The most recent summaries of this literature are Hanushek (1979), Lau (1979), Thomas (1977) and Bridge, Judd, and Moock (1979). Examples of specific studies are Summers and Wolfe (1977), Brown and Saks (1975), Murnane (1975), and Hanushek (1972).

2. For example, between 1930 and 1977, current expenditures per student in average daily attendance in U.S. elementary and secondary schools increased from $298 to $1,578 in constant 1976-1977 dollars. Between 1960 and 1972, the expenditure levels rose from $749 to $1,412, with little change since 1974 (Golladay and Noell, 1978:72).

3. Witness the diverse efforts represented among the papers in these two volumes. See especially the studies discussed and cited by Brown and Saks (1979) and by Burstein (1979).

4. For example, student attitudes are incorporated into a model of the educational production function in Levin (1976b), and cognitive test scores and their variance among students are addressed in Brown and Saks (1975).

5. An interesting distinction between the school as an institution and the school as an organization is developed in Meyer chapter 1 in this volume.

6. It is assumed that the effect of effort on instructional services is positive within the normal ranges of effort that are relevant to the teaching process. However, this does not mean that the relation need be monotonic. There may be a level of "overeffort" at which the teacher is trying too hard so that instructional services deteriorate. For some evidence of this among students who were "overly motivated," see Atkinson, Lens, and O'Malley (1976).

7. The crucial effect of instructional time and exposure to instruction on student learning is emphasized in the research findings of Wiley (1976). An attempt by Karweit (1976) to replicate the Wiley results using similar data sets for other populations are unsuccessful. The time variable represents the crucial determinant of learning outcomes in the mastery learning paradigm (Bloom, 1976), and it is an important target of investigation in many recent analyses of learning at the classroom level. See, for example, Thomas (1977), Fisher et al. (1978), and Harnischfeger and Wiley (1979).

8. The meaning that I am imparting is close to that of autonomous artisan or craftsperson. However, since these terms are not likely to be used in conjunction with teachers, I have used the term "autonomous professional." The traditional concept of the professional was very much an autonomous individual who "defined the unique quality of a subject, its special basis in an exclusive and independent circle of natural experiences" (Bledstein, 1976:88).

9. Teachers are hardly unaware of the tension created by the constraints of the organization of their desires for greater autonomy in the instructional process (see Lortie, 1975:175-86).

10. Insights can be found in Tyack (1974). Callahan (1962) is more specific about the particular aspects of scientific management that were adopted by the schools. Wirth (1977) reviews the social efficiency mentality that contributed to the formation of the present educational approach.

11. Details on the evidence and processes are found in Bowles and Gintis (1976), Katz (1968, 1971), Cohen and Lazerson (1972), Feinberg and Rosemont (1975), and Levin (1978). Insights on the relations between school and workplace are found in Dreeben (1968).

12. Works that focus on changes in the work process and their determinants include Braverman (1974), Gutman (1977), Noble (1977), and Marglin (1974). The analysis of the organizational aspects of schools within this context is found in Bowles and Gintis (1976) as well as in the works cited in note 10.

13. See Weber (1946) for his well-known essay which explicated the advantages of bureaucracy for the emerging corporate capitalist order of the late nineteenth century. A representative work of Taylor's is *The Principles of Scientific Management* (1911), which summarizes his earlier publications. Taylor's major impact in the early twentieth century was to "streamline" the established corporate bureaucracies by making them more "efficient." The role of the emerging professional engineers and scientists in molding

technology to fit these social forms of production is found in Noble (1977; also see Baran and Sweezy, 1966).

14. It is interesting to cite Weber on the advantages of bureaucracy with respect to this transformation: "Bureaucratization offers above all the optimum possibility for carrying through the principle of specializing administrative functions according to purely objective considerations. Individual performances are allocated to functionaries who have specialized training and who by constant practice learn more and more. The 'objective' discharge of business primarily means a discharge of business according to *calculable rules* and 'without regard for persons" (1946:215).

15. Related literature refers to many of the capacity variables as abilities rather than capacities. I have preferred to use the word "capacity" for two reasons. First, the word "ability" often connotes cognitive capacities, while I would argue that physical and emotional or affective capacities are also part of the overall construct of teaching capability. Second, ability connotes innate and fixed human traits, while I have asserted that capacity can be altered through experience, training, and other modes of socialization. See the use of the term ability in studies of work performance in Vroom (1964), Porter and Lawler (1968), and Heneman and Schwab (1972). These studies also utilize constructs of effort in conjunction with ability to explain employee performance. An ability-motivation approach to explaining intellectual performance is used by Atkinson, Lens, and O'Malley (1976).

16. Effort is considered to be a derivative of motivation in the work performance literature. See Vroom (1964) and Porter and Lawler (1968).

17. Of course, to a certain degree persons who offer their services into teaching are likely to be self-selecting or different from the general population with college degrees. That is, persons who feel that they are able to tolerate or even prefer the existing definition of the teacher role are more likely to become teachers than those who cannot accept the conditions of the job. While Lortie (1975:ch. 3) examines teacher recruitment, he does not review systemmatically many of the potential intellectual and personality differences between teachers and nonteachers. However, he concludes that teaching tends to attract females and rather conservative persons who are "favorably disposed toward the existing system of schools" (Lortie, 1975:54).

18. The concept of autonomy through workplace democracy is not a common one, but it is becoming increasingly salient as an approach to organizing work. The political theory underlying workplace democracy is found in Pateman (1970). Various applications are presented in Jenkins (1974). The educational implications are developed in Levin (1978).

19. Lortie (1975:ch. 4) does an excellent job of reviewing the reward structures. Teachers indicated that the psychic rewards of teaching—such as feeling that they had "reached" their students—gave them the greatest amount of satisfaction. How often this occurred, under what conditions, and the degree to which there are obstacles to "reaching" students are not explored by Lortie. However, inferences can be drawn from what appear to be relatively low proportions of respondents who would definitely choose teaching again (only about half) that these sources of satisfaction do not appear to compensate

many teachers for the negative conditions of their situation (see the data cited by Lortie, 1975:91); further insights into the frustrations of the teaching role are found in his chs. 7, 8, and 9. Pencaval (1977b) reviews the general problem of using systems of remuneration to increase effort and productivity, particularly under conditions where productivity cannot be easily assessed. Pincus (1974a) has reviewed more generally the system of external incentives in education.

20. At least thirty states have implemented or are in the process of implementing student testing programs for assessing and certifying that students have attained minimal competency levels. The organizational implications are explored in Mitchell and Spady (1978).

21. In my view, the independent dynamic of the school (such as its emphasis on equality while reproducing inequality) is a significant source of change that has been ignored in much of the radical literature, which has emphasized the correspondence of the school with the needs of capitalist production rather than its divergence from them. Compare the relatively functionalist approach of Bowles and Gintis (1976) and Carnoy and Levin (1976) with the emerging dialectical analysis in Levin (1978) and Levin, Carnoy et al. (forthcoming).

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Toward a multilevel perspective on the allocation of educational resources

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Introduction

This paper starts from the premise that resources for education are allocated in meaningful ways at a variety of organizational levels, some more centralized than others, and proceeds to demonstrate the importance of incorporating this premise into the analysis of resource allocation for education. Existing research tends to concentrate on the allocation of resources at the federal, state, and district levels of educational systems and neglects the process by which resources, once they reach school districts, are distributed among and within schools and classrooms. Although this preoccupation with resource allocation at what have been called *macro*levels (Thomas, 1977) is understandable in light of the methodological problems raised by the analysis of resource allocation at more *micro*levels (Brown & Saks, 1980a; Monk, 1979), it runs the risk of obscuring important elements of the process by which resources flow to students for the purpose of producing learning outcomes.

Moreover, existing research has failed to account adequately for the effects resource allocation decisions made at one level have on resource allocation decisions made at other levels of the system. Most studies concentrate on resource allocation at one level and implicitly treat decision makers at other levels as if they were passive recipients of the effects of resource allocation decisions. Going further, the responses at other levels to decisions made at one level can, in turn, influence the process through which subsequent decisions are formulated. Existing research has neglected this *reciprocal* dimension to the resource allocation process, and has thereby overlooked potentially important dynamic issues.

The lack of knowledge about the interactions that occur among decision makers situated at different levels within schooling systems is the more serious of the two problems addressed in this paper. Questions of equity and efficiency cannot be answered until we know more about how levels of decision making affect one another. What is especially disheartening about the existing research is that even when the studies conducted at different levels are considered collectively, it is not possible to gain insights into the interactions that underlie the reported results.

This is also a problem that has led some analysts to question the usefulness of presuming that decision making within educational organizations has a systematic character (see, e.g. Cohen, March, & Olsen, 1972; Weick, 1976). My claim is that ignorance of the interactions among decision makers stems more from neglect than from an alleged nonsystematic or anarchistic nature of decision making in education. Moreover, I am especially hopeful about the potential for economic tools of analysis to yield insights into the interactions that occur.

My arguments are supported by means of a review of research dealing with the allocation of resources at various levels of the educational system, moving from highly centralized levels to increasingly decentralized microlevels. The paper first reviews studies of the allocation of state fiscal resources among school districts, second, examines the distribution of resources within school districts, and third, considers the limited amount of research that deals with the allocation of resources among students within classrooms. At each level well-known studies are identified that may be thought of as prototypes for the type of research being assessed. In addition to providing detailed critiques of these exemplary studies, references to numerous additional studies that the interested reader may wish to consult are included.

The purpose of this review is to (a) demonstrate the tendency for analysts to concentrate on resource allocation at a subset of the levels at which resource allocation decisions are made; (b) discuss the small amount of progress that has been made toward understanding the interactive nature of the decision-making process as it pertains to the allocation of resources; and (c) articulate the importance from a policymaking perspective of remedying these limitations in the current literature. Research into the allocation of state resources among school districts is discussed first.

The Analysis of State Grants-in-Aid for Education

The focus of much of the literature on educational resource allocation is on the means by which schools are financed. Beginning with the work of Ellwood Cubberley (1905), analysts have systematically analyzed programs of school finance and made recommendations for improvements. In recent years, due in part to the intervention of the judiciary, this type of research has flourished and has become part of what is popularly known as the school finance reform movement.

Current efforts in this area of research are devoted in large part to the analysis of the various reforms that have been or could be adopted by a state legislature. Benson (1978) noted that this type of research can be conveniently categorized as having either a theoretical, descriptive, or econometric orientation, and that in each case the focus of the analysis is on the impact of reform on expenditures, revenues, or local school tax values. The focus on expenditure, revenue, and tax rate issues has led analysts, regardless of their orientation, to adopt the school district or the state as the unit of analysis. The question of how the means by which school districts are financed affects the internal operation of the districts is typically considered outside the scope of these studies. Even when attention is given to such internal phenomena as the distribution of resources among budget categories, little attention is given to what underlies the budget-making process. In other words, the district's decision to spend a certain portion of the budget on a given category is treated as a district level phenomenon which may be affected by changes in the distribution of state aid and not as a phenomenon that grows out of the interaction between decisions made by the state and decisions made by the actors within the districts. The following discussion reviews first a widely respected and influential descriptive study of the impact of school finance reform and, second, a number of attempts to conduct more theoretically oriented analyses of the real or potential effects of state intervention.

School Finance Reform: The Illinois Case

Beginning in 1974, Alan Hickrod and his colleagues initiated a series of attempts to describe the impact of the 1973 reform of school finance in Illinois over time (Hickrod et al., 1974, 1975, 1976, 1978, 1979). They employed four basic criteria to assess the impact of the reform and the first of these was labeled "permissible variance."

Permissible variance was measured by the coefficient of variation of expenditure per pupil and the tax rate among districts, as well as by an index designed to assess changes in the pattern of expenditure among districts which spend less than the median district in the state. In general, the research showed that for the first four years after the 1973 reform the overall disparities in expenditure levels and tax rates declined. In the more recent period, following a set of amendments to the reform, expenditure disparities have begun to increase (Hickrod et al., 1979).

"Fiscal neutrality" constituted the second criterion employed by Hickrod and was assessed by means of a Lorenz curve which graphically represented the distribution of state and local revenues among students on the basis of district wealth. For example, if the poorest 20 percent of the students were situated in districts that received 20 percent of the available state and local monies, the poorest 40 percent of the students were situated in districts that received 40 percent of the monies, and so on, then the Lorenz curve would form a straight line and the state would have achieved a fiscally neutral distribution of resources for education. Fiscal neutrality was measured in terms of the degree to which the Lorenz curve drawn for Illinois students approached a straight line. The findings indicated that when Chicago was omitted from the analysis there was a gain in fiscal neutrality in the period immediately following the 1973 reform, but that when Chicago was included the results were mixed and in some cases revealed movement away from the goal of fiscal neutrality. Hickrod's team explained these results by noting that (a) the 1973 reform increased the flow of state funds to the Chicago school district and (b) Chicago is, on the average, a comparatively wealthy school district according to standard measures of wealth. By distributing additional funds to an allegedly wealthy district, the 1973 reform moved the state away from a narrow definition of fiscal neutrality which failed to account for the unique character of the Chicago school district. Since 1976, however, Hickrod has shown that many of the gains in fiscal neutrality found by the early studies have been erased (Hickrod et al., 1979).

For the purpose of examining progress toward the goal of equal expenditures for equal effort, Hickrod and his colleagues regressed state and local revenues on the local tax rates and used the "goodness of fit" of the equation as measured by the R^2 statistic to estimate the degree to which the system resulted in equal expenditure for equal effort. Once again the results were mixed, indicating that directly after the 1973 reform, expenditures for a given level of effort were more equal for some types of districts (elementary and unit) but not for others (high school).

In order to assess geographic inequalities, district level data were stratified according to geographic characteristics of the districts. These analyses indicated that the central cities, suburban high schools, and suburban elementary schools all gained relative to rural unit districts and, to a lesser extent, rural elementary districts in the aftermath of the 1973 reform.

As can be seen from the types of questions that were asked and the modes of analysis that were employed, Hickrod and his associates were concerned with the effects of reform on interdistrict differences in expenditure levels and tax rates and not with the effects of the reform on the internal operation of the districts. Moreover, the Hickrod team was primarily concerned with how the Illinois districts responded to the changes in financing in contrast to why the districts responded as they did. By focusing on district level responses, the analysis falls short of demonstrating the impact of changes in the state aid formula on the educational offerings of the districts; by neglecting the analysis of why the districts responded as they did, the study yields little understanding of how actions taken at the level of the state interact with actions taken within the districts.

While it is admittedly unfair to criticize a study for not providing analyses that were never promised, these omissions are serious from a policymaking perspective. It is possible for inequities to occur whenever resources are allocated and the preoccupation with highly aggregated fiscal data precludes examination of internal inequities. For example, it would be useful to know whether the variance in the distribution of resources among students within school districts increased, decreased, or remained the same following the 1973 reform. Moreover, any attempt to understand the long-term implications of the reform is heavily dependent on an understanding of the interactions between state and district level decision makers. Presumably, subsequent changes in financing formulas are affected by how districts respond to earlier changes. In fact, Hickrod and his associates have probably heightened the importance of this type of reciprocal relationship by documenting the first-round responses so clearly.

Fortunately, the Hickrod team is aware of how important it is to consider the implications of reform over time and on a yearly basis have begun to document school districts' responses (Hickrod et al., 1975, 1976, 1978, 1979). Hickrod's work is significant in that it provides rare insight into the year-by-year results of a major effort to restructure a program of state aid for education. As this work progresses, we can look forward to the development of a rich data base that should permit an in-depth analysis of district responses over time to changes in state financial policies.

Determinants of District Spending Levels

In contrast to the Hickrod studies where the emphasis was on documenting districts' responses to school finance reform, other analysts have been more explicitly concerned with identifying the factors that explain the responses observed. Among the many responses that changes in state aid can lead to is an adjustment in the level at which school districts choose to spend. The landmark research dealing with the determinants of expenditure levels in U. S. elementary and secondary schools was conducted by H. Thomas James and his colleagues in the 1960's (James, 1961; James, Thomas, & Dyck, 1963). These analysts recognized that subventions on the part of the state could have the effect of either raising local expenditure levels or reducing tax rates, and attempted to determine the conditions under which one response was more likely than the other. A model was developed which explained expenditure levels in terms of a complex interaction of factors representing (a) the demand for education, (b) the ability to pay for education, and (c) the political mechanism used to express collective preferences. Since each of these factors can be conceptualized at local as well as state levels, the model holds open the possibility for conflict to develop between the levels with respect to the appropriate level of educational spending.

Empirical analyses based on a sample of 772 school districts drawn from 10 states sought to determine how increases in state support were related to (a) variations in property taxes and expenditure levels within states and (b) local initiative with respect to the support of local schools (James et al., 1963). Briefly summarized, the findings suggest that the mean level of state support is unrelated to variation in either tax rates or expenditure levels within states. The relationship between state support and local initiative proved to be more complex. On the one hand, the evidence revealed a curvilinear relationship between the level of state support and the level of per pupil spending such that beyond a certain point, increases in state support are associated with reductions in district expenditure levels. This result suggests that districts in states where support is comparatively high tend to use state revenues as a substitute for local taxes. On the other hand, the evidence suggested that the state has considerable discretion over the extent to which this substitution occurs, by virtue of restrictions that can be imposed on local voters' access to the local tax base. One of the conclusions of the study was that unless state mandates are established, a point exists beyond which increases in state support will be used to replace rather than complement revenues derived from local sources. According to this analysis, it is not a foregone conclusion that increases in state support will be matched by increases in expenditure for education. Local districts, unless constrained, have considerable discretion over how the increased flow of state resource will be utilized.

More recently, attempts have been made to use economic approaches to understand and in some cases predict changes in expenditure levels and local tax rates which occur in response to changes in state financial policy (Barro, 1974; Carroll, 1979; Feldstein, 1975, 1978; Gatti, Tashman, & Sweet, 1978; Grubb & Michelson, 1974; Hartman & Reischauer, 1974; Ladd, 1975; Stern, 1973; Vincent & Adams, 1979). Economists have begun to realize that before analysis can be conducted of the effect on local spending of state grants-in-aid, it is necessary to specify the manner in which the state aid is distributed. Distinctions are drawn between open-ended matching grants which have the effects of reducing the net *price* paid by the local unit for the services in question and block-grants which increase the wealth or *income* of the local unit without changing relative prices (Feldstein, 1975).

In one noteworthy paper (Hartman & Reischauer, 1974), a series of policy alternatives that might face state legislators were outlined and analyzed in terms of the likely responses of districts within the state. Specifically, Hartman and Reischauer examined the implications of a choice between (a) providing a generous minimum level of support combined with a low matching rate for whatever a district chose to spend above the minimum level, and (b) a less generous minimum level of support combined with a comparatively high matching rate for expenditure levels above the minimum.

A three-step analysis was carried out. First, district responses to changes in the matching rate were assessed. Districts were categorized as exhibiting either (a) "low price sensitivity" if their response to a lowering of the matching rate was to substitute state for local resources, leaving expenditure levels unchanged, or (b) "high price sensitivity" if their response was to leave the local tax rate unchanged and to use the forthcoming state aid to increase spending for education. Hartman and Reischauer speculated that most districts would choose a middle ground by using the state funds to both reduce local taxes and to increase educational spending. Moreover, they noted that if price sensitivity were correlated with original expenditure levels, the net effect of the state's decision to increase the rate at which it matched local revenues would be a widening of expenditure disparities within the state.

Second, attention was given to district responses to a reduction in the minimum level of support offered by the state. The analysis revealed that at one extreme a local unit could respond by reducing only *non*-educational expenditures, and that at the other extreme, a local unit could respond by lowering its educational expenditures by the amount that the minimum grant declined. Districts falling into the former category were labeled "low-income effect" districts, while districts falling into the latter category were labeled "high-income effect" districts. Once again, Hartman and Reischauer reasoned that most local units would choose a middle ground by simultaneously reducing educational as well as noneducational expenditures as the minimum grant declined.

Third, in light of the likelihood that most school finance reform proposals, if adopted, would have the effect of changing both the matching rate (price effect) and the minimum level of support (income effect), Hartman and Reischauer combined the analyses carried out in steps one and two and sought to identify the *net* effect of reform on district expenditure levels. These results were used in turn to determine whether proposed reforms would result in net increases or decreases in the state budget for grants-in-aid. Their conclusions suggest that a shift in policy from a generous minimum aid program to a high matching rate would be associated with increased aggregate tax burdens and expenditures, and that the districts responding by increasing their expenditure levels would be disproportionately represented by already high spending districts. These conclusions indicate that instead of promoting equality, reform may increase disparity in expenditure levels among districts. Hartman and Reischauer concluded, in terms similar to those used by James and his colleagues in the 1960's, that state imposed mandates which restrict local access to the tax base hold considerable promise for ameliorating such "undesirable" results of school finance reform.

Although these inquiries into how and why district expenditure levels and tax rates respond as they do to changes in state financial policies have heightened our appreciation of the fact that (a) districts are *not* passive recipients of resource allocation decisions made at the state level and (b) depending on the design of the grant-in-aid program, districts can respond in markedly different ways, we are not currently able to predict the actual effects on expenditure levels and tax values of proposed reforms. This uncertainty stems in large part from our inability to identify which districts are likely to exhibit high rather than low price as well as income sensitivity.

Moreover, this line of research says relatively little about the reciprocal nature of the interaction between state and local decision makers. In particular, little is known about how the state will respond in turn to the local decisions prompted by the initial change in state financing policies. Until we gain appreciation for this reciprocal dimension of the interaction it will be impossible to assess the long run implications of proposed changes in school finance policies.

Distribution of Resources Among Budget Categories

A related line of research which shows promise of providing insight into the resource allocation process *within* educational organizations as well as insight into the interactive nature of the resource allocation process across levels of aggregation, deals with the impact of the means by which organizations are financed on the distribution of funds among budget categories (Alexander, 1974; Barro & Carroll, 1975; Brown, 1972; Carroll, 1976; Chambers, 1978; Kirst, 1976; Levin, 1974). By examining the allocation of funds among categories of expenditures within organizations, these studies consider resource allocation processes *within* districts and schools. Moreover, by recognizing that the manner in which a district spends funds can influence the state's decision to supply grants-in-aid, these studies have the potential to throw light on the reciprocal nature of the interaction between state and district level actions.

As an example of how the budget response of districts to an influx of state aid can fuel the public debate over school finance reform consider Moynihan's (1972) assertion that whatever additional revenues districts receive as a consequence of reform would be used to increase existing teachers' salaries, a result Moynihan deplored. Empirical analyses of this phenomenon have yielded interesting results with respect to Moynihan's claim.

For the purpose of illustrating the potential as well as the limitations of this type of research, one of the more sophisticated and well known studies in this line of inquiry is reviewed. Barro and Carroll (1975) attempted to answer questions related to the effects of changes in expenditure levels on decision making within districts by examining budget data from 195 Michigan school districts with 2,000 or more pupils in average daily attendance. These analysts used the economic theory of constrained maximizing behavior to guide their empirical inquiry. According to their adaptation of this theory, administrators and school board members try to allocate their budgets in a way that maximizes a function of "resource-use" characteristics. In other words, district-level decision makers are presumed to attempt to maximize some combination of inputs. According to this approach, administrators might seek to maximize (a) the number of teachers on the staff, (b) the number of para-professional aides, and (c) the level of experience of the teachers in the district. Moreover, the theory holds that these attempts to maximize inputs are subject to constraints of various kinds. In particular, Barro and Carroll considered the constraints imposed by (a) the size of the budget, (b) the prices of the inputs, and (c) the institutional limits on admissible choices. Given this approach, the current budget level enters the analysis as an exogenous variable, while prices such as teachers' salary levels are considered to be endogenous variables that can be explained by the size of the per pupil budget and other factors.

Much of the empirical portion of the study was designed to determine how much of an increment in a school district's budget tends to be associated with (a) changes in spending patterns for teachers, administrators, specialists, and other nonpersonnel resources; (b) changes in teacher-pupil ratios, average teacher salaries, and the experience and training of teachers; and (c) changes in the structuring of salary schedules for teachers. In addition, attention was given to the effects of socioeconomic characteristics of school districts on spending patterns.

Two modes of analysis were employed. First, cross-sectional data representing two successive years were analyzed. Second, an analysis was conducted of the "discretionary budget," defined as that portion of a given year's budget that is not committed to the support of personnel and other resources retained by school districts from the previous year. The goal of this analysis was to determine how a district spends funds over which it exercises some degree of discretion.

Briefly summarized, Barro and Carroll's findings revealed a tendency for increases in budget levels to be associated more with increases in spending for specialists, supplies, and equipment than with increases in spending for teachers and administrators. Moreover, the analysis indicates that the increases in spending for teachers that were observed could be accounted for more by reductions in class size than by increases in average salaries. Finally, the analysis showed that the increases in average salaries were due more to increases in the training and experience levels of teachers than to increases in the salary schedule.

When attention turned to price and socioeconomic effects, Barro and Carroll found that starting salaries as well as a proxy for the opportunity wages for teachers were unrelated to teacher-pupil ratios. They also found that the socioeconomic status of the district was positively related to per pupil spending for teachers and administrators and negatively related to per pupil spending for other resources (specialists and nonpersonnel resources).

Analysis of the discretionary budget indicated that districts with high teacher-pupil ratios in the previous year tended to use discretionary funds to hire teachers rather than other types of resources. Barro and Carroll interpreted this finding in terms of the "taste" of certain districts for high teacher-pupil ratios, but did not analyze why some districts exhibit such tastes.

Contrary to Moynihan's claim that increases in districts' budgets will be used to raise existing teachers' salaries, Barro and Carroll's research revealed that only 10.5 cents out of a dollar per pupil increment in the budget level tends to be spent to raise the level of teachers' salary schedules, a finding which is similar to those reported by others (Alexander, 1974; Chambers, 1978; Kirst, 1976). However, as satisfying as it might be to bring empirical evidence to bear on an important policy issue, care must be exercised. Barro and Carroll are well aware of this and caution that one of the dangers associated with their study is that policymakers may misinterpret the findings to conclude that by using state policy to change low spending districts into high spending districts, the state will be able to alter the spending patterns within the districts in the manner suggested by the empirical findings. This problem can be solved, in part, by comparing spending patterns before and after changes in the school finance program. Kirst (1976) adopted this approach and found results similar to those reported here.

A second problem, from a policymaking perspective, stems from the fact that not all districts need respond in the same fashion to changes in state financial policies. The effect of an influx of general purpose aid from the state in a low spending, highly industralized suburb may be distinct from the effect of increased aid in a low spending residential suburb or rural area. Barro and Carroll began to examine this issue by relating socioeconomic status characteristics to expenditure levels, but it may be the interactions between spending levels and socioeconomic characteristics that are especially important. Indeed, some of the theoretical work dealing with the micro-economics of resource allocation (Thomas, 1977) suggests that these interactions deserve careful study.

Third, by studying the outcomes of budgeting processes, it was impossible for Barro and Carroll to assess the effects of changes in the budget level on the activities within schools and classrooms. Specifically, their analysis could not address questions about how the materials and personnel associated with higher expenditure levels were combined to produce educational services. Simply because a district spends more in a certain category of the budget says little about the equity and efficiency with which the resources are utilized in the schools and classrooms.

The Barro and Carroll study represents a significant step forward in the analysis of school finance, but it should be viewed as an early effort to promote understanding of the linkages between state and local resource allocation processes. Moreover, by relying on explanations that depend on exogenously determined "tastes," the analysis is seriously impaired in its ability to explain why districts respond as they do to change.

Distribution of Resources Among Schools

While it is potentially useful to analyze the impact of state aid on the allocation of funds across budget categories, it is also important to understand more about the relationship between grants-in-aid and the distribution of resources among schools within districts. Bowles and Levin (1968) drew attention to this issue in their celebrated critique of the Coleman Report:

> Schools that are attended by disadvantaged children are characterized by substantially lower expenditures than are those attended by advantaged students. Accordingly, the average per student expenditure for the school district probably overstates the actual expenditures for schools attended by students from the lower class and understates expenditures for schools attended by students from the higher social classes. (Bowles & Levin, 1968, p. 9)

Unfortunately, due in part to the general lack of program and building level financial records, it has been difficult to study this important aspect of resource allocation. Even so, the phenomenon has received some scholarly attention (Andrew & Goettel, 1972; Brishetto, 1980; Ginsburg, Moskowitz, & Rosenthal, 1980; Grubb

& Michelson, 1974; Guthrie, Kleindorfer, Levin, & Stout, 1961; Owen, 1972, 1974; Sexton, 1961; Summers & Wolfe, 1976). To the extent that districts are segregated internally on a school by school basis on the grounds of race or poverty, intradistrict resource allocation studies such as those cited above make it possible to identify the existence of unacceptable resource allocation practices on the part of local school officials. It is not surprising to find that many of these studies deal with the questions of racial discrimination in urban settings. Weinberg (1979) has provided an informative historical analysis of this type of research.

Alan Ginsburg and his colleagues addressed a general version of the intradistrict resource allocation question in a recent study where they examined the distribution of staff among elementary schools in all of New York State's school districts (Ginsburg et al., 1980). In a creative use of data drawn from two levels of aggregation (the district and the school) these analysts were able to decompose the variation in the supply of such variables as the number of professionals per pupil, median teacher education, median teacher experience, median teacher salary, average teacher salary, and paraprofessional staff per pupil into between- and within-district components.

In addition to estimating the relative magnitudes of the between- and within-district sources of variation, Ginsburg and his associates were interested in identifying the correlates of each school's share of the available staff resources within a given district. They identified three factors that they argued were likely to affect the internal allocation practices: (1) the presence of minority students within a school, (2) the presence of students from families receiving public assistance payments, and (3) the presence of students with low standardized achievement test scores.

A one-way analysis of variance revealed that with one exception most of the variation among schools in the staffing variables can be attributed to differences between rather than within districts. The paraprofessional staff per pupil is the exception with upwards of 70 percent of the observed variation attributable to differences among schools within the same district.

In addition, multiple regression analysis revealed that the between- and within-district sources of variation work to offset one another. For example, the study shows that schools in districts with a higher incidence of minority pupils tend to have fewer professionals per pupil, but that within a given district, the schools with the higher incidence of minority pupils tend to have greater numbers of professional staff per pupil. These authors used their results to conclude that across school variation in staff inputs in New York State is a result of both between- and within-district allocations and that inequities in interdistrict allocation are alleviated to some extent by intradistrict resource allocations (Ginsburg et al., 1980, p. 25).

As important as these findings are, they need to be interpreted carefully. For example, the results are based on the implicit presumption that all students within the same school receive the identical supply of resources. To the extent that staffing characteristics vary systematically across programs (or tracks) within schools, the conclusion that most of the variation in staffing characteristics exists across districts may be misleading. Moreover, it would be a mistake to use Ginsburg's findings to conclude that local administrators refrain from discriminating against minorities and impoverished students. It may be true that disproportionate shares of district resources are provided to schools with disproportionate numbers of impoverished minority students, but it may also be true that the majority of these "extra" resources are shifted away from the disadvantaged students within their schools. This possibility suggests that a complacent attitude regarding the potential for inequitable resource allocation practices to exist at the local level may be ill-advised.

Finally, as the authors acknowledge, it is impossible to distinguish between staff hired with district funds and staff hired with Federal categorical aid such as Title I funds. It may be that the extra resources observed in the "poorer" schools within the districts are attributable more to Federal policy than to the extra supply of local resources.

From a policymaking perspective, school based studies of resource allocation practices hold considerable promise but as yet have contributed relatively little. The chief problem is a lack of theory that is capable of explaining why different levels of resources are supplied to different schools. The fact that variation exists among schools within districts is only potentially troubling. The lack of a clear sense of what type of variation is appropriate precludes a definitive evaluation of the inequality we observe. Moreover, even if we could agree that the status quo is unacceptable, we lack an understanding of how we might achieve a more desirable distribution of resources. Vague references to restrictions the state can impose on the uses of grants-in-aid that neglect the question of how the restrictions are to be enforced are not likely to solve this difficult problem.

This concludes the review of research dealing with state grants-in-aid for education. Although analysts can boast of the sophisticated methodologies they use to document the possible as well as the actual impact of change in state financial policy, their ability to *predict* even short-term responses is surprisingly limited given the massive scale of research conducted in this area. Some recent developments within the economics of education are promising with respect to the desire to predict responses, but so long as analysts fall back on exogenously determined tastes to explain their results, little additional progress can be expected.

The following section reviews research that deals primarily with the productivity of educational resources. This research involves the estimation of production functions and is concerned typically with the allocation of resources at the level of the school district.

Education Production Functions

By arguing that educational processes are analogous to industrial processes, analysts in recent years have drawn on economic theory to guide efforts to estimate the relationships between the provision of school resources and the production of educational outcomes. Collectively, these studies comprise the educational production function literature.

The application of economic theories of production to the study of education is in its infancy and is, not surprisingly, plagued by a large number of unresolved problems. (See Averch et al., 1974; Levin, 1976; Lau, 1979. For a more optimistic assessment, see Hanushek, 1979.) For the purpose of this discussion, the difficulties associated with single level analyses of the productivity of school resources will be emphasized. By treating teachers and students as if they were passive recipients of actions taken at the district level, production function studies are unable to account for the interactions that exist among the district, school, and classroom levels of educational systems. Since the goal of these studies is to determine the linkage between the provision of certain types of resources at centralized levels, such as the district or school, and the production of outcomes within classrooms, the neglect of these interactions may be serious from a policymaking perspective.

The two studies selected for discussion are among the better known and well regarded efforts that have been made in this area of research. Considered together, the studies are well suited for demonstrating the progress that production function analysts have made in recent years in addition to the serious problems that remain. As argued below, the findings reported in both studies are difficult to interpret from a policymaking perspective, since the analysts neglect the effects of the decision making of teachers and students.

Martin Katzman (1971) conducted a production function analysis of 56 Boston elementary school districts. On the basis of data specified without exception at the level of the district, Katzman selected six indicators of the consequences of schooling. These outcome measures were (1) the rate of average daily attendance, (2) the rate of continuation of elementary school graduates through high school, (3) the difference in median reading scores between a district's second- and sixth-grade students, (4) the median level of mathematical competence scores for fifth-grade students, (5) the percentage of sixth-grade students who voluntarily took a placement exam for a prestigious public high school, and (6) the percentage of sixth-grade students who passed that placement exam.

Input variables were divided into two categories: school resources and social characteristics. School resources were measured in terms of (a) expenditures per pupil, (b) percentage of accredited teachers, (c) percentage of teachers with masters degrees or beyond, (d) percentage of permanent teachers with over 10 years of experience, (e) percentage of students in uncrowded classrooms, (f) pupil to teacher ratio, (g) the annual rate of teacher turnover, and (h) the number of students per district. As a measure of socioeconomic status, Katzman chose the percentage of males in white collar occupations because it contributed most to explaining variation in performance among the districts when school resources were held constant.

Step-wise regression procedures were used to identify the subset of school variables that were most able to predict performance of the districts with respect to each of the six outcome variables. Katzman's general conclusion was that schooling makes a difference, and that changes in school resources can have substantial impact on performance (Katzman, 1971, p. 74).

However, as Katzman freely recognized, his findings need to be interpreted with care. For example, the finding that teacher experience is more strongly related to the production of educational outcomes than is teacher training can not be interpreted as evidence of the need for school administrators to hire highly experienced teachers with limited formal training. First, Katzman's use of highly aggregated data precluded the analysis of variation in performance of individuals within school districts. Since one of Coleman et al.'s (1966) findings was that more variation exists within rather than among school districts, Katzman's findings regarding the analysis of variation among districts are of more limited use to district policymakers than may at first appear to be the case.

Second, Katzman failed to account for the decision making that goes on within schools and classrooms. The production function approach depends on the assumption that the production process under study operates with what economists call technical efficiency. This amounts to assuming that all individuals with discretion over production seek to produce the maximum possible level of output obtainable from given inputs. If this assumption of technical efficiency is unrealistic, the analyst faces the more complicated task of understanding and predicting how individual decision makers respond to changes in the supply of one or more of the inputs.

There are four interrelated reasons for questioning the assumption that educational systems operate in a technically efficient fashion. First, a large number of actors have discretion over the production of education. State legislators, school board members, district and school administrators, teachers, students, and parents all affect what and how educational outcomes are produced. The assumption of technical efficiency seems to be based on the belief that the actors within an organization are united in the pursuit of the specified goals. In the case of educational organizations, the size and diversity of the group of decision makers who influence production make it difficult to justify the assumption that such an agreement exists.

Second, the outcomes of the educational process are numerous and are difficult to define clearly. This characteristic exacerbates the potential for decision makers within educational systems to disagree over what to produce. For example, school administrators may emphasize cognitive achievement as measured by standardized tests; teachers may focus on affective outcomes; and students may be most interested in developing athletic skills. The net result of these disagreements may be variation across districts in the nature of the mix of outcomes that is being produced. To the extent that this is the case, the analyst is unable to justify the assumption that any one mix of outcomes is being produced in a technically efficient fashion. As we shall see in the following study, one approach to this problem is to restrict the sample using some prior beliefs about the nature of the outcomes that are being produced.

Third, it is difficult, and not necessarily desirable, to eliminate the diversity of goals pursued within schools and classrooms. For example, the protection accorded teachers through salary schedules and guarantees of tenure limits the ability of centralized decision makers to require teachers to pursue a predetermined set of goals. Furthermore, schools are able only under extreme circumstances to expel students who choose to pursue goals that run counter to the goals of school officials.

Fourth, even if agreement could be reached among the decision makers regarding which goals are most appropriate, there is the further question of determining how to achieve the agreed upon goals. If students' learning styles differ, procedures that are technically efficient for one group of students may not be efficient for another group.

In the absence of the assumption of technical efficiency, the estimates of the structural parameters of the so-called production functions are measures of the statistical association between the dependent and independent variables. Causation is not established and it is therefore inappropriate to use the estimates of the parameters to calculate the inputs' marginal productivities. In other words, it is inappropriate to claim that the estimates of the parameters can be used to evaluate the relative effectiveness of the various input variables.

Richard Murnane's (1975) production function study of 875 inner city black children was based on pupil specific data. In contrast to Katzman's research, Murnane's data were specified at the level of the individual student and included observations of the same students at different points in time. These data allowed

Murnane to analyze variation among schools as well as among classrooms. Moreover, by restricting his study to inner city black students, Murnane hoped to reduce variation in the nature of the mix of outputs that were being produced.

As part of his empirical analysis, Murnane compared the explanatory power of alternate models of educational productivity. In one model he used techniques of multiple regression to estimate relationships between a student's end of the year test scores and (a) the student's beginning of the year test scores; (b) background characteristics such as sex, whether the student lived in publicly subsidized housing, the percentage of rental units on the student's block with rent of less than $60 per month, and the population under 18 years of age on the student's block living in a female-headed family; and (c) the number of days the student attended school during the year. The explanatory power of the model was compared to that of otherwise identical models which included either dummy variables representing the students' classrooms or dummy variables representing the students' schools. In addition, the explanatory power of the model including the dummy variables for classrooms was compared with that of the model including the dummy variables for schools. Murnane found statistically significant differences in the explanatory power of all three models and showed that important differences in productivity exist among classrooms as well as among schools.

Methodologically, Murnane's study is evidence of the progress that production function analysts have made since the publication of Katzman's study. By adopting the student as the unit of analysis, Murnane was able to analyze all of the variation in performance among students and not just the fraction of variation that remains once variation within districts is averaged out of the analysis. Moreover, the findings of the empirical analyses outlined above are pertinent to the question of whether or not schooling makes a difference. However, it is one thing to show that class and school placements are associated with differences in students' achievement, and quite another to understand why the differences occur. From a policymaking perspective, insights into why differences occur are vital.

Murnane's attempt to explain these differences raised methodological problems that are reminiscent of those Katzman faced. Although the student was the unit of analysis, Murnane was forced to use measures of instructional resources that were specified at the level of the classroom. For example, the principals' ratings of their teachers, the teachers' level of education and experience, and the class size were used to represent the flows of resources to individual students. By virtue of this reliance on classroom level data to represent the treatment of individual students, Murnane neglected the decision making of teachers and students with respect to the allocation of resources among students *within* classrooms.

The question of the effects on learning of the internal operation of classrooms also raises conceptual issues. Production function studies are based on the assumption of technical efficiency, and Murnane's study is no exception. The decisions of teachers, students, and parents have important effects on the production of education and the interaction of these effects is complex and not adequately accounted for by simply assuming that the decision makers all endeavor to produce the maximum level of some output obtainable from given inputs. Even if the methodological problems discussed above were overcome and outcomes as well as inputs were properly specified, the assumption of technical efficiency would still be difficult to justify.

Notice that one of the logical next steps in the development of this line of research is effort to determine whether inputs measured on a pupil-specific level (using classroom observation data to distinguish among students situated in the same classroom) can explain gains in pupil performance. (See Brown & Saks, 1980b for some early efforts along these lines.) Notice further that such studies will neatly avoid having to explain why some students receive different resources compared with others. Instead the emphasis undoubtedly will be on using the net results of the resource allocation process to explain differences in pupil performance.

But information about how certain types of resources affect certain types of students is relatively useless from a policymaking perspective unless we also know something about how resources are distributed within the system. Suppose, for example, production function research shows conclusively that a certain type of resource is highly effective when supplied to a particular type of student. It might seem fairly straightforward to conclude from such findings that this type of student could be helped simply by purchasing more of the resources that were identified as being highly effective, but such a conclusion neglects the possibility that the newly purchased resources may never reach the students they were intended to benefit.

While the next generation of production function studies holds considerable promise, it will be unfortunate if efforts are not made simultaneously to understand how resources are distributed at the more micro-levels of the educational system. In the next and final section of this paper, the limited progress that has been made in this area of research is discussed.

Micro-Level Analyses

The vast literature dealing with the internal operation of schools and classrooms suffers from neglect of economic kinds of phenomena. Most school and classroom research has been conducted by psychologists and sociologists who understandably have not been concerned with economic issues. Even when efforts have been made to consider schools or classrooms from a resource allocation perspective (Alexander & McDill, 1976; Harnischfeger & Wiley, 1980; Heyns, 1974), the analysts have not drawn on economic theories to explain and interpret the phenomena.

Moreover, as we have seen, research into the economics of the production of education has yet to account for the manner in which inputs are transformed into outcomes within the context of classrooms. Even in the highly sophisticated micro-level production function studies (Hanushek, 1971; Murnane, 1975; Summers & Wolfe, 1977), analysts rely on classroom level data and are therefore unable to shed light on why differences occur among classrooms and among different students within classrooms. With the notable exception of Brown and Saks (1975, 1980a), economists have been relatively unconcerned with the application of economic principles to the internal operations of schools and classrooms.

Barr and Dreeben (1977, p. 152) commented on this state of affairs by noting:

> The production function and classroom instruction research traditions have had little to say to each other, despite their common preoccupation with the effects of schooling. Classroom instruction consists in good part of the allocation of resources to student learning, but to understand the allocative process we need to know what classrooms are like, how they work, and what situations

> affecting the allocation of resources arise in them. Without knowing the problems teachers encounter and the patterned set of instructional activities that reflect their responses to these problems, it is not possible to establish connections between the two traditions.

This neglect of the economics of resource allocation within schools and classrooms is especially unfortunate given our need to understand interactions that occur among levels, since many of the reasons why administrators, teachers, students, and parents respond as they do to changes in financial policies at more centralized levels may grow out of economic kinds of phenomena that operate at micro-levels. Specifically, it would be desirable to gain an understanding of how such economic phenomena as (a) the substitution of inputs, (b) economies and diseconomies of scale, (c) jointness in the costs of resources as well as in the production of outcomes, and (d) the allocation of nonpurchased resources such as students' time affect the manner in which resources are combined within schools and classrooms for the purpose of producing learning outcomes.

The following discussion reports recent theoretical developments in this area of research as well as some preliminary empirical findings. The section concludes with a discussion of the potential for this type of research to contribute to the development of a multilevel approach to educational resource allocation.

Resource Allocation Within Schools and Classrooms

While the empirical work of Brown and Saks (1975) dealt with interdistrict comparisons, their theoretical work can be applied to the analysis of the internal operation of schools and classrooms. They explicitly introduced the tastes or preferences of school authorities into their analysis and distinguished between school officials labeled "levelers" who prefer smaller to larger dispersions of achievement scores and school officials labeled "elitists" who are willing to accept wider dispersions of achievement for the sake of higher mean levels of achievement. Brown and Saks were able to show that the preferences or tastes of school officials can affect how resources are allocated among students within schools.

Brown and Saks also suggested that because of variation across students in the marginal products of the given inputs, decisions about the allocation of resources among students may also depend on how productive individual students are with respect to the available inputs. They attributed these differences to the nature of educational technologies. For example, they argued that the training of teachers and the design of materials may facilitate learning by specific types of students. Such differences in the ability to benefit from specific types of resources may also be related to the nature of the prior investments in students' capabilities because students can be trained to benefit from different types of resources.

Finally, Brown and Saks (1980a) considered the nature of the resource constraint as it applies to education. If a resource has what economists call social good characteristics, the benefits derived by anyone consuming the good are externalized in the sense that they continue to be available to others. One commonly cited example of a resource with social good characteristics is a public park, since more than one individual can simultaneously benefit from public parks. Brown and Saks argued that the allocation of resources among students depends on the degree to which educational resources constitute social goods.

Recent work at the Educational Finance and Productivity Center at the University of Chicago (Kemmerer, 1980; Monk, 1979, 1980a, 1980b; Thomas, 1977; Thomas, Kemmerer, & Monk, 1979) and elsewhere (Kiesling, 1978) has brought conceptual as well as empirical analyses to bear on the allocation of resources within schools and classrooms. As a means of conducting this inquiry, Thomas and his associates developed a concept called student efficiency. Although student efficiency is roughly analogous to what might be referred to as student ability or achievement, an important distinction needs to be kept in mind. Specifically, student efficiency refers to input-output types of relationships at a given time and not necessarily to the net results of prior learning activities. While one student may be more efficient than another with respect to a given set of inputs and outputs, it does not follow directly that the more efficient student has the higher level of achievement. Before achievement levels can be inferred from information about efficiency levels, more needs to be known about the types of outcomes that were produced as well as the types of inputs that were utilized over time.

Depending on how inputs and outputs are defined, student efficiency can be specified with varying degrees of refinement. For example, inputs might refer to "educational resources" in general or a distinction might be drawn between human and material types of resources. Going further, it is possible to refine the notion of human resources and speak of whole class, small group, and individualized types of human resources; similar refinements can be made for material resources.

Outcomes can also be specified with varying degrees of refinement. For example, we can speak of school effects or learning outcomes, or we can distinguish between cognitive and affective types of learning outcomes. Distinctions can also be made between mathematical and verbal cognitive outcomes, as well as between problem solving and computational forms of mathematical skills.

Regardless of the level of refinement, it is possible to specify student efficiency at a variety of levels of aggregation, including the individual student, the classroom, the school, as well as the district levels. When dealing with aggregations, it is possible to consider characteristics of the distribution of efficiency, for example the mean, variance, and skewness with which a given type of student efficiency is distributed within a given grouping of students.

This conceptualization of student efficiency is rich in implications for resource allocation. Among other things it suggests that production possibilities are affected by (a) the nature of the stock of available inputs, (b) the mix of outcomes that are to be produced, and (c) the efficiency with which individual students as well as aggregations of students are able to translate the available inputs into the desired mix of outcomes.

In addition to analyzing the implications of student efficiency, Thomas and his associates have given explicit attention to the decisions students make with respect to their willingness to supply time to learning activities. Drawing on economic theory, these analysts have argued that students' time is a valuable economic resource and that its value, as measured by its opportunity costs, has implications for both the students' willingness to supply time and the decisions made by teachers and others about the purchased resources that are supplied to students.

This research also considered the influence on the allocation of resources of the manner in which resources are structured within classrooms. According to this approach, teachers make decisions with respect to how available purchased resources are *combined* with students' time. Each of these combinations was defined as an educational technology, and the overall structuring of the combinations was defined as a classroom technology (Thomas, 1977).

Rather than treat the classroom technology as a constant, the approach which appears to be adopted in most educational production function studies, emphasis was placed on the variable nature of the classroom technology. Specifically, it was argued that classrooms vary in the degree to which they are differentiated technologically. In addition, it was suggested that the level of technological differentiation is linked to the resource allocation behaviors of teachers, students, parents, and administrators.

In an empirical study, Monk (1979) examined the supply of teacher resources that took the form of (1) whole class instruction, (2) small group instruction, and (3) the supervision of seatwork to 103 fifth-grade students situated in 13 classrooms. In an analysis of variance, he found that most of the variation in the supply of these resources existed among rather that within the classrooms, thereby suggesting that contextual variables such as the means and dispersion of student efficiency and the structuring of resources within classrooms may be important determinants of differences among classrooms in the nature of the available mix of resources. When attention turned to variation *within* classrooms, Monk found that while in general there was little within-classroom variation, in some cases within-classroom variation was pronounced.

Efforts to explain the variation in the supplies of these resources met with mixed results. While proxies for student efficiency such as achievement test scores when aggregated to the classroom level were positively related to the incidence of small group instruction ($r = .48$) and negatively related to the incidence of whole class instruction ($r = -.53$), the relative standing of pupils within their respective classrooms, as measured by test scores as well as other proxies for student efficiency, was comparatively unable to explain the relative standing of pupils with respect to their individual supplies of resources. In no case was more than 30 percent of the within-classroom variance explained. Even so, the analysis revealed interesting differences in the resource allocation process within classrooms that were related to differences in the subject being taught.

Summarizing, most of the research dealing with the economics of resource allocation at micro-levels has been conceptually oriented. In general, the analysis suggests that the supply of resources to individual students depends on (a) the nature of the stock of available resources; (b) characteristics of the distribution of student efficiency (at various levels of aggregation and specified with varying degrees of refinement); (c) the preferences or tastes of officials with respect to the preferred distribution of outcomes; (d) the degree to which the available inputs enjoy social good characteristics; (e) the decision making of students; (f) the structuring of resources within classrooms.

While this conceptual work constitutes a coherent means of predicting and explaining variations in resource flows among students, the approach neglects several potentially important questions. For example, even though the conceptual analysis holds open the possibility that resource allocation processes vary depending on the mix of outcomes being produced, there is no means as yet to explain why these differences exist. Although Monk found that the process at work in mathematics classes differed from that in social studies classes, he was unable to explain why the differences occur.

Second, even though the analysis considers the interaction between students and teachers, relatively little attention has been given to the interaction between teachers and administrators. The tendency has been to consider how the *available* stock of resources is allocated rather than the more difficult but important question of how the nature of the available stock is determined. Before this approach can claim to provide a truly multilevel analysis of resource allocation, this type of issue must be more adequately addressed.

Third, more attention needs to be given to the interactions that occur among the identified determinants of the resource allocation process. For example, teachers might behave in an elitist fashion when they work with so-called fast classes and in a leveling fashion when they work with comparatively slow classes. Or, even within a single class, a teacher may allocate resources differently within a fast group than within a slow group.

The empirical work in this area of research must overcome serious methodological obstacles, only two of which will be mentioned here. First, the concept of student efficiency needs to be more satisfactorily operationalized. While test scores offer the advantage of convenience, they measure stocks of human capital and not the students' ability to benefit from and substitute among particular types of resources. A high scoring student may be more adept at learning using one type of resource than another. This is pertinent information for the purpose of analyzing resource allocation practices and can easily be obscured by an achievement test score.

Second given the interest in student decision making, it is necessary to have a means of measuring students' willingness to supply time to education. Current methods for assessing "on task" and "off task" behaviors can be seriously questioned in terms of how validly they reflect levels of student engagement. This problem is particularly serious when the goal is to distinguish among different degrees of engagement.

Despite these limitations to both the conceptual as well as empirical analyses, this type of research holds considerable promise. As we learn more about resource allocation processes at microlevels, it will become possible to consider the implications of fiscal policies that are formulated at more centralized levels. For example, changes in the nature of the available stock of resources by virtue of the introduction of a programmed text or the hiring of teacher aids can be assessed in terms of their effect on the distribution of resources within classes. Moreover, the research shows promise of contributing to our understanding of the reciprocal nature of the interaction between levels of decision making, since the research focuses, in part, on teacher responses to student decision making as well as on student responses to teachers' decisions.

Classroom-level inquires also promise to focus attention on questions of equity and efficiency at the point where resources are transformed into learning outcomes. While progress may have been made in some states toward narrowing disparities among districts in per pupil expenditure levels, classroom level inquires suggest that significant and possibly disturbing disparities continue to exist among students within schools and classrooms. Finally, microlevel studies can serve to facilitate more accurate estimates of input-output relationships, and can therefore constitute a means of promoting efficiency as well as equity in the production of educational outcomes.

Conclusions

Research dealing with resource allocation in education is dominated by single level modes of analysis with a disproportionate amount of attention given to the analysis of resource allocation at the more centralized or macrolevels. Before we can understand and predict short- as well as long-term implications of proposed changes in financial policy, we need a more thorough understanding of the various resource allocation processes that underlie the figures that appear in financial records. Although the research currently underway into the microeconomics of resource allocation suggests that we can look forward to a more equitable balance between research dealing with macrolevels and research dealing with microlevels, it is not at all clear that we are moving toward an understanding of how the levels interact. From a policymaking perspective, the integration of the findings and analyses conducted at the various levels is vital and should be highly ranked on the resource allocation research agenda.

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One of the best-selling American books on the economics of education, written from a neo-classical perspective. Provides a good reference for those wanting a solid grounding in benefit–cost and production function analyses. Other chapters address education and economic growth, planning, teacher salaries and the financing of education.

Cole, K., Cameron, J., & Edwards, C. *Why Economists Disagree: The Political Economy of Economics.* Longman, London, 1983.
The authors of this book provide a fresh, new approach to understanding the differences among neo-classical, institutional and neo-Marxian economists, and how and when each of the schools evolved. They even ask 'Can we choose which (of the approaches) is correct?', to which they answer 'Both yes and no'. No, because the core propositions of each 'school' are not amenable to

empirical investigation and yes, in relation to the efficacy of each theory's policy prescriptions. In their final chapter they seek to explain the stance of the major UK political parties at the moment, in terms of the three schools of economics.

Commonwealth Schools Commission. *Schools Resources Study* (Parts 1 and 2). CSC, Canberra, 1981, 1983.
The Schools Resources Study was an investigation into the distribution of publicly funded recurrent resources to government and non-government schools in all states and territories except Queensland. Part 1 reported financial statistics, system by system. It first looked at the direct and indirect school costs of all systems, then of each individually. Part 2 reported a sample investigation based on individual government school statistics which shed light on the extent of variability in direct school costs per student, and in the importance for costs of various contributory factors such as enrolment mix and size.

Davey, P. 'Financing of education'. In R. B. Scotton & H. Ferber. *Public Expenditures and Social Policy in Australia.* Vol.1 *The Whitlam Years, 1972–75.* Longman Cheshire, Melbourne, 1978.
The chapter provides a statistical review of the magnitudes and patterns of educational expenditures during the mid-1970s, then discusses the increasing role of the commonwealth in funding the various sectors of education and in student finance over this period. It then attempts to evaluate the extent to which the Whitlam Government achieved its twofold objectives of expanding the volume of resources allocated to education and promoting equality of opportunity.

Dreeben, R., & Thomas J. A. (eds). *The Analysis of Educational Productivity,* Vol. 1 *Issues in Microanalysis.* Ballinger, Cambridge, Mass., 1980.
This book is at the forefront of recent attempts to use microeconomic tools to analyse the processes of education at the school and classroom level. Chapter headings read like the headings in a textbook of educational theory, but the approach is clearly economic. The most challenging chapter is that of Brown & Saks on 'Production technologies and resource allocation in classrooms and schools'.

Garms, W. I., Guthrie, J. W., & Pierce, L.C. *School Finance: The Economics and Politics of Public Education.* Prentice-Hall, Englewood Cliffs, NJ, 1978.
Much of this book describes the structure and financing of public schools in the United States of America, but the topics are treated critically, and reform suggested, from a set of explicit value statements. As such, it provides a useful institutional framework within which to assess educational policies.

Groenewegen, P. 'Trends in modern economics'. *Current Affairs Bulletin,* vol. 6, no. 4, 1984, pp. 17–29.
In this article the writer reviews the major developments in economic theory and policy over the past half-century and discusses the present state of the discipline. To understand his arguments, it would help if you have studied economics.

Gurwitz, A. S. *The Economics of Public School Finance.* Ballinger, Cambridge, Mass., 1982.
This is a welcome book aimed at facilitating communication between economists and other professionals involved in school finance analysis and policy-making (in the United States of America). To do this the author develops a common vocabulary, describes a set of basic concepts and explains the more useful technical tools of economic analysis as applied to school finance. In the process he tries to establish what economic analysis can and cannot do well. Separate chapters are devoted to the normative and the predictive theories of educational expenditures.

Haller, E. 'Cost analysis for educational program evaluation'. In W. J. Popham (ed.). *Evaluation in Education: Current Applications.* McCutchan, Berkeley, Calif., 1974.
This paper gives a clear exposition of the economic concept of cost, how it is measured, and how the researcher can apply the principles of costs to costing educational programs. It provides a good non-technical introduction for any researcher who wants to consider the costs of implementing an educational innovation, but who has no background in economics.

Hancock, G. 'The finance of schooling'. In R. Mendelsohn (ed.). *Australian Social Welfare Finance.* George Allen & Unwin, Sydney, 1983.
This is a useful introductory statement of the institutional arrangements for financing schooling in Australia. The focus is on the role of the Commonwealth Government's Schools Commission and of federal–state relations in Australia. The writer does raise some interesting questions about alternative methods of financing education within our institutional structures.

Hanushek, E. A. 'Education policy research – an industry perspective'. *Economics of Education Review,* vol. 1, no. 2, 1981, pp. 193–223.
The writer makes a critical review of the state of the art in production function (input–output) analyses. He concludes that until we get a fuller understanding of the separate elements of good teaching, it will not be possible to find a small set of factors affecting pupil achievement in a consistent way. He pleads for economists to pay greater heed to organisational patterns, decision processes and the legal constraints as they affect educational efficiency.

Harman, G. S, & Selby-Smith, C. (eds). *Readings in the Economics and Politics of Australian Education.* Pergamon, Rushcutters Bay, NSW, 1976.
The book is evenly divided between issues of governance and politics, on the one hand, and economics and finance, on the other. Part 5 on financing addresses federalism and education, the matter of fee abolition and government aid. Part 6 on resource allocation includes the relation of educational and economic growth. Part 7 looks at the economics of teacher labour markets, and rates of return to education.

Harrold, R. I. *Economic Thinking in Education.* Teaching Monograph No. 1, University of New England Press, Armidale, NSW, 1982.
What can one say about one's own book? Modestly, it is a clear, concisely written, interesting introduction to economic aspects of decision making in

education. It is meant for the administrator who wants to deepen his or her understanding of the economist's approach to problems of resource allocation in education. The first three chapters outline basic economic ideas which are applicable to education, and the role of the economist in policy making. The last three chapters discuss the nature and measurement of educational costs and benefits and of project assessment techniques.

Juster, F. T. (ed.). *Education, Income and Human Behaviour*. McGraw-Hill, New York, 1975.
This is a collection of essays which seeks to quantify the benefits of further education in non-market as well as market activities. Among the more interesting chapters are the effect of education on the allocation of women's time, on consumption behaviour, on fertility and on crime. Those chapters which address the conventional 'rates of return' analysis, do so in a critical, sophisticated way.

Lindsay, A. W. 'Institutional performance in higher education: The efficiency dimension'. *Review of Educational Research*, vol. 52, no. 2, 1982, pp. 175–99.
Two dimensions of institutional performance perceived by Lindsay are effectiveness (the congruence between outputs and goals) and efficiency (the relation between inputs and outputs). The paper investigates some of the problems of conceptualising and measuring inputs and outputs to assess (changes in) efficiency at the level of the individual educational institution. It highlights the difficulties of taking account of quality in efficiency analysis, and of making use of analytical findings in administrative decision making.

McKenzie, R. B. 'The economist's paradigm'. *Library Trends*, vol. 28, no. 1, 1979a, pp. 7–24.
The article gives a simple introduction to neo-classical microeconomics, directed to librarians. Most attention is paid to how the market mechanism sets book prices. The writer then applies his ideas to allocative problems within libraries.

McKenzie, R. B. *The Political Economy of the Educational Process*. Nijhoff, Boston, Mass. 1979b.
The author tries to demonstrate how economics can contribute to our understanding of how education occurs. His focus is on the economics of the process rather than the product of educational activity. Specifically, he seeks to explain how and why the student goes about acquiring whatever human capital he or she wishes and how the institutional setting of the university influences the amount of human capital that the student acquires. In the process the author analyses not only student study and examination behaviour but also lecturer remuneration, committee participation and marking practices.

McKenzie, R. B., & Tullock, G. *The New World of Economics: Explorations into the Human Experience*. Irwin, Homewood, Ill., 1975.
This book provides a provocative introduction to the neo-classical economic approach to a whole range of human behaviour – sex, the family, crime and dishonesty, politics, bureaucracy, and learning. The authors seek to demonstrate how simple economic notions can be usefully applied to provide fresh ways of thinking about 'non-economic' topics. Lively reading.

Nelson, F. H. 'Six myths about productivity and education'. *Educational Theory*, vol. 33, nos 3 & 4, 1983, pp. 179–89.
This article seeks to 'explore misconceptions about productivity and education. He exposes six of these myths: (1) educational productivity remains low because schools are not managed like businesses; (2) educational productivity would increase if we utilised more machines; (3) teacher pay hikes should be linked to productivity growth; (4) rising costs show falling productivity; (5) unless educational productivity improves, consumers of education will shift spending to other goods and services; and (6) the United States of America is so rich it should be able to put even more resources into education. Much of the author's case is rendered weak, however, because he omits to explain exactly what he means by educational productivity.

Noah, H. J. 'Education needs rational decisionmaking'. In L. H. Browder (ed.). *Emerging Patterns of Administrative Accountability*. McCutchan, Berkeley, Calif., 1971.
A simply written, straightforward account of the role of an economist in educational decision making. The writer stresses that economising implies an interest as much in maximising benefits as in minimising costs. He applies this interest to budgeting, criticising the traditional line-item budget and highlighting the potentialities of program budgeting techniques.

Odden, A. 'Financing educational excellence'. *Phi Delta Kappan*, vol. 65, no. 5, 1984, pp. 311–18.
Odden argues that current educational administrators find the situation of declining resources hard to cope with, for they were largely trained in times when increased demands were met by 'add-ons'. That is, complaints about inadequate pay were met by pay increases; complaints about inadequate vocational training were met with new colleges. These costly solutions are less available when resource flows are not rapidly increasing. He suggests a series of strategies of resource reallocaton and internal change (called 'school improvement') by which increased educational services might be generated without large increases in outlays. Odden draws some interesting distinctions in approach between the pursuits of excellence and equity.

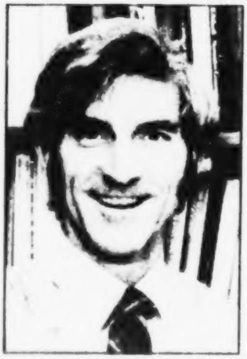
Pincus, J. 'Incentives for innovation in public schools'. *Review of Educational Research*, vol. 44, no. 1, 1974, pp. 113–44.
This is a good example of the economist's approach to trying to find ways of encouraging members of an educational bureaucracy to behave in ways which contribute to innovation and change. Pincus uses the model of the competitive firm to develop and test a series of predictions about the conditions under which innovations might take place in educational organisations.

Thomas, J. A. *The Productive School: A Systems Analysis Approach to Educational Administration*. John Wiley, New York, 1971.
An early but still valuable introduction to the application of economic concepts to decision making in schools. The author makes an interesting distinction between the administrator's, the psychologist's and the economist's perceptions of the production function. He reminds the reader of the importance

of using marginal analysis in considering choices about changes in school activities. In doing so he highlights the ways in which the physical capacities of classroom accommodation cause massive discontinuities in the marginal costs of teaching an increased number of pupils.

Thomas, J. A. 'Issues in educational efficiency'. In J. Guthrie (ed.). *School Finance Policies and Practices: A Decade of Conflict*. Ballinger, Cambridge, Mass., 1980.
In line with his interest in the microeconomic analysis of education, Thomas examines the roles of parents, students, administrators and school boards in addressing issues of efficiency. He points up the problems of defining efficiency in multi-goal, multi-client educational organisations. Distributional and efficiency issues become intertwined. He reviews various ways of modelling the relationship between means and ends in education. A focal aspect of his analysis is students' time – inside and outside school – as a valuable, scarce resource.

About the author



Ross Harrold is a senior lecturer in the Centre for Administrative and Higher Education at the University of New England, Armidale, NSW. He studied economics and education at the University of Western Australia, then taught in the Technical Education Division of the WA Education Department. Subsequently he taught in the School of Social Sciences at the Western Australian Institute of Technology and in the Department of Education at the University of Western Australia. He has been at the University of New England since 1976. He is author of *Economic Thinking in Education.*

Acknowledgments

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